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HARRIS (H. A.). **Morphologic studies of Septoria lycopersici.**—*Phytopathology*, XXV, 8, pp. 790–799, 3 figs., 1935.

Morphological studies on material secured from a monospore culture of *Septoria lycopersici* isolated from garden-grown tomatoes at Urbana, Illinois, and treated with Dickson's combination stain (*Science*, N.S., lii, p. 63, 1920) showed the mycelium to be of two types, namely, hyaline and thin-walled (1·2 to 5·8 μ), and brown and thick-walled (2·2 to 5·8 μ), the former being characteristic of the early stages of the leaf spot and the latter of the more advanced ones. As shown by Levin (*Tech. Bull. Mich. agric. Exp. Sta.* 25, 1916), the mode of pycnidial formation is symphyogenous. The pycnidial cavity is initiated by a schizogenous process, but pycnospore production is also preceded by a lysigenous action. The pycnospores are formed by basipetal elongation of the sporogenous cells, separation from which is effected by a basal constriction, without intervening conidiophores. They germinate by the formation of a lateral germ-tube from the middle cells and by elongation of the terminal ones. Ostiole formation is induced by the tensional strain of the pycnidial wall on the leaf epidermis, and by pressure of the pycnospores on the pycnidial wall. Tomato leaves are penetrated by the fungus through the stomata, the mycelium developing intercellularly and the cells being entered by means of haustoria.

PIRONE (P. P.). **Spotted wilt of Tomatoes and Peppers in New York.**—*Plant Dis. Reptr*, XIX, 15, p. 244, 1935. [Mimeographed.]

Spotted wilt of tomatoes [*R.A.M.*, XIV, p. 763] is stated to have been recognized for the first time in New York State during the summer of 1935, when suspected material from Onondaga County was verified by M. Gardner. For two consecutive years pepper [*Capsicum annuum*] leaves and fruits, especially of the California Wonder variety, in Schenectady County have borne the large ring spots characteristic of tomato spotted wilt. Needle-prick inoculations of young pepper plants with inoculum from diseased pepper leaves (but not from the fruits) induced marked dwarfing with considerable foliar mottling and slight distortion.

SOLOVIEFF (F. A.). Физические и механические свойства древесины Клена с начальной стадией гнили от гриба **Fomes connatus Fr.** [Physical and mechanical properties of Norway Maple wood in the incipient stage of the rot caused by *Fomes connatus* Fr.]—*Mitt. forsttech. Akad., Leningrad, 1935*, 6, pp. 22–46, 6 figs., 1935.

Recent investigations showed that in the region of Leningrad from

61 to 100 per cent. of the Norway maples (*Acer platanoides*), aged from 60 to 120 years, are affected with an internal condition of the trunk locally known under names equivalent to 'false core' or 'dark heart'. In cross section this condition appears as a roughly circular, dark grey area, separated from the normal light coloured wood by a dark green line, 1 to 1·5 mm. in width. It was shown experimentally to be the incipient stage of the heart rot caused by *Fomes connatus* [*R.A.M.*, xi, p. 173], frequently involving 78 per cent. of the length of the useful part of the maple trunk, while the more advanced, destructive stage of the rot is for the most part restricted to the base of the trunk and seldom involves more than 17 per cent. of the total length. Special tests showed that the 'false core' wood is but slightly inferior in its mechanical properties to healthy wood, and that it may be safely used in positions sheltered from weather variations and especially from humidity. The wood is valuable for joinery work, owing to its often beautiful pattern and pleasant colour, and also to its slightly superior hardness and lesser hygroscopicity. In advanced stages of the rot, the wood is broken down and cavities are formed, the decayed wood being fibrous and not powdery.

The paper gives brief notes on the less frequent rots in the region due to *F. igniarius* [ibid., xv, p. 63], *F. fomentarius* [ibid., xiv, p. 795], *Polyporus spumeus*, *P. squamosus* [ibid., xiv, p. 794], *Hydnum septentrionale* [ibid., v, p. 394], and *Armillaria mellea* [ibid., xv, p. 63]. It also contains a list of other broad-leaved trees, on which *F. connatus* has been found in the region.

Vailonis (L.). **Lietuvos Beržų rėta.** [The 'wisa' disease of Birch in Lithuania.]—*Scr. Hort. bot. Univ. Kaunas*, iii, pp. 5–36, 4 pl., 1935. [Lithuanian, with German summary.]

The external symptoms of the 'wisa' disease of birches [*R.A.M.*, xii, p. 253] in Lithuania were found to correspond with those described from Finland by Hintikka, but the explanation given by the latter of its etiology as a masked gummosis is not regarded as convincing. The disease occasions the development of local pathological symptoms in the pith of the younger branches of the stem, and the writer's studies indicate that the disturbance is initiated by chemical compounds in groups of the primary cambium cells destined to develop into vessels. This leads to the formation of abnormal tissues containing hardened resinous substances, as shown by micro-analytical tests, the pathological changes involved being particularly conspicuous along the walls. The internal 'chemical wounds' thus arising are the starting-point for the production of specific hormones which stimulate the adjacent healthy tissues to abnormal action. These substances are quite distinct from the ordinary wound hormones and may be diffused through the trunk by means of the medullary rays to produce further abnormalities. In due course the affected cambium recovers and begins to produce normal vessels.

Wolf (F. A.). **The perfect stage of a leafspot fungus on Red Mulberry.**—*J. Elisha Mitchell sci. Soc.*, li, 1, pp. 163–166, 2 pl., 1935.

Emended Latin diagnoses are given of *Mycosphaerella mori* (Fkl) and

of its conidial stage which was first named *Fusarium maculans* Béreng. but is transferred by the author to *Cercosporella* as *C. maculans* comb. nov., other synonyms being *Septoria mori* Lév., *Fusisporium mori* Mont., *Phleospora mori* (Lév.) Sacc., *S. moricola* Pass., and *Phleospora moricola* (Pass.) Sacc. [*R.A.M.*, viii, p. 339]. The fungus is stated to be a common agent of a fuscous to ochraceous, brown-edged leaf spot of the red mulberry (*Morus rubra*) in the eastern United States, Great Britain, France, Italy, Germany, and Lower Austria. The natural host of the organism not being available for inoculation experiments, the evidence for a genetic connexion between the perithecial and conidial stages rests on the presence of perithecia in old conidial lesions, the similarity of cultures isolated from conidia and ascospores, and the previously established relationship between certain other fungi with analogous imperfect and perfect stages.

The fungus is characterized by short, hyaline conidiophores, 3- to 10-septate, hyaline conidia, 20 to 60 by 5 to 8 μ, gregarious, spheroid, membranaceous, dark-coloured perithecia, 60 to 80 μ in diameter, and basally fasciculate, clavate, aparaphysate asci, 35 to 40 by 5·5 to 6·5 μ, containing eight subdistichous, curved, uniseptate ascospores, 12 to 14 by 3·5 to 4 μ.

KIMURA (K.). **A new disease of Mulberry-tree caused by Claudopus nidulans (Pers.) Peck.**—*Appl. Mushroom Sci.*, i, 1, pp. 9–16, 5 figs., 1935. [Japanese, with English summary.]

Claudopus nidulans has been observed to occur as a wound parasite of mulberry in the Nagano and Ehima prefectures, Japan, the sporophores usually appearing from the middle of June to the end of July. The fungus attacks and eventually kills the sapwood, the heartwood being only superficially invaded; ultimately the whole tree dies. The pale colour and fragile consistency of the decomposed wood place the agent of decay in the lignin-dissolving group [cf. *R.A.M.*, xiv, p. 667, 668]. The elliptical spores of the fungus measure 7 to 8·8 by 3·5 to 4·5 μ and are pink in the mass.

CORMIO (R.). **Contributo di osservazioni sul Ganoderma applanatum (Pers.) Pat. e sulla sua azione sul tronco di Abete rosso, Picea excelsa Link.** [Observations on *Ganoderma applanatum* (Pers.) Pat. and its action on the trunk of Red Spruce, *Picea excelsa* Link.]—8 pp., 12 figs., Milan, 1935. [Abs. in *Riv. Pat. veg.*, xxv, 7–8, p. 319, 1935.]

An account is given of the growth of the fruiting body of *Ganoderma applanatum* [*R.A.M.*, xv, p. 16] on an old trunk of spruce (*Picea excelsa*) killed by unfavourable soil conditions and infested with animal parasites. The growth of the fruit body and effect of the fungus on the wood and heartwood are described in detail.

ANDREYEFF (I. E.). Сердцевинная гниль Пихты в северно-восточной части южного Урала. [Heart rot of the Spruce in the north-eastern part of southern Ural.]—*Mitt. forsttech. Akad. Leningrad, 1935*, 6, pp. 113–124, 3 figs., 1935.

Firs (*Abies*) and Spruce (*Picea*) in the Bashkir Republic of the U.S.S.R.

is stated to be attacked chiefly by *Pholiota adiposa* [see below, p. 72] and *Fomes hartigii*, the first of which causes a heart rot in the lower part of the trunk and extending into the roots. The affected tissues are canary-yellow at first, and later drab brown; short sinuous cracks appear in the rotted wood, rather like insect tunnels but resembling, in tangential sections, shallow cells. Occasionally narrow, sinuous black lines occur in the wood, and in the final stage of the rot a hollow is formed. *F. hartigii* causes a heart rot which is yellowish-brown at first and later light yellow. The decayed timber contains thin, white mycelial membranes, appearing in radial sections as white spots, and also numerous black lines. Surveys in the region showed that the total average incidence of the two rots varies in the various stands from 11·8 to 24·3 per cent., the percentage of the trees in the incipient stage of the rot varying from 5·4 to 5·9. Special tests [details of which are given] indicated that the timber of such trees is but very slightly inferior in its mechanical and physical properties to that of healthy trees, and that it may be quite safely used after proper seasoning for constructional purposes, provided it is not exposed to damp situations.

VANINE (S. I.) & ANDREYEFF (I. E.). Физические и механические свойства древесины Ели с начальной стадией гнили от гриба **Fomes annosus.** [Physical and mechanical properties of Fir timber in the initial stage of the rot caused by *Fomes annosus*.]—*Mitt. forsttech. Akad. Leningrad, 1935*, 6, pp. 9–21, 4 diags., 1935.

A tabulated account is given of experiments, the results of which showed that fir [*Abies* sp.] timber affected with the initial stage of the rot caused by *Fomes annosus* [*R.A.M.*, xiv, p. 663], characterized by a bluish-purple or occasionally brownish-yellow discoloration, is but slightly inferior in its mechanical properties to sound timber; its resistance to lateral compression and to bending was found to have been lowered by 2·4 to 8·4 per cent., and by 3 per cent., respectively, of that of sound wood. The hardness of the affected wood, on the other hand, was increased by 4·7 to 6·6 per cent. and the specific gravity by 0·5 to 4·1 per cent., while its water-containing capacity was lowered by 10·2 per cent. of that of sound wood. Shrinking from desiccation and swelling from moisture imbibition in the affected wood were not materially altered.

LIESE [J.]. **Zur Bildung von Kiefern-Hexenbesen.** [On the formation of Pine witches' brooms.]—*Z. Pilzk.*, xix, 2, p. 55, 1 fig. on pl. 8 facing p. 49, 1935.

Further evidence is very briefly adduced in support of the heritability of witches' brooms of pines in Germany [*R.A.M.*, xiii, p. 202]. Cones from diseased trees produced offspring of which one part showed the typical witches' broom habit, a second grew normally, while a third exhibited comparatively mild symptoms. The condition must be regarded, in the light of these facts, as a bud mutation.

MILLER (J. K.). **A new species of Keithia on Red Cedar.**—*J. Elisha Mitchell sci. Soc.*, li, 1, pp. 167–171, 1 pl., 1935.

An English diagnosis, accompanied by a very brief Latin one, is given

of *Keithia juniperi* n.sp., found parasitizing red cedar (*Juniperus virginiana*) leaves in North Carolina in 1934. The disease, which may involve the death and subsequent desiccation of the foliage, may be recognized by the presence on the lower leaf surfaces of one to three black apothecia, which remain attached to the substratum for an indefinite period and may be detected in a decaying condition on fallen material. Infected leaves persist on the trees for the normal period, and though the disease may be abundant on individual trees its economic significance cannot yet be definitely assessed; it is thought, however, to be of potentially serious import to red cedar. In its morphology the new *Keithia* generally resembles the four other known representatives of the genus, except for its eight ascospores, which are olive-brown, uniseptate, 28 to 30 by 15 to 18 μ, with very unequal cells, the distal invariably the larger, and are contained in olive-brown, broadly ovate, paraphysate asci, 80 to 90 by 40 to 50 μ.

HEPTING (G. H.). **Blue stain development in peeled Shortleaf and Loblolly Pine pulpwood.**—*Paper Ind.*, **xvii, 6**, pp. 402–404, 1 diag., 3 graphs, 1935.

In the course of observations on felled 30-year-old shortleaf pine [*Pinus echinata* Mill.] in North Carolina and on 32-year-old loblolly [*P. taeda* L.] in South Carolina, little difference was detected in the amount of blue stain [*Ceratostomella* spp. and other fungi: *R.A.M.*, xiv, p. 612] of the sapwood of timber stacked in different ways, details of which are given. In both species of pine practically all the staining developed during the first six weeks of stacking, at the close of which period 33 per cent. of the sapwood volume of the shortleaf bolts was stained and 36 per cent. of that of the loblolly. In the former species 58 per cent. of the stain was graded as dark, 37 per cent. medium, and 5 per cent. light, the corresponding figures for the latter being 38, 55, and 7 per cent., respectively. A preliminary test in the treatment of the pulpwood with one of the effective stain-preventive solutions extensively used on the timber at southern sawmills gave promising results, reducing the incidence of infection from an average of 15 per cent. to nil.

HATFIELD (I.). **Toxicity in relation to the position and number of chlorine atoms in certain chlorinated benzene derivatives.**—*Proc. Amer. Wood Pres. Ass., 1935*, pp. 57–66, 1 fig., 1935.

A tabulated account, preceded by an introductory note and a brief historical survey of previous investigations on analogous lines, is given of the writer's tests on the toxicity of fifty chlorinated benzene derivatives [*R.A.M.*, x, p. 766; xiii, p. 791] to the blue-staining organisms, *Ceratostomella pilifera* and *C. pluriannulata* [ibid., xiv, p. 729] and to *Fomes annosus* [ibid., xiv, p. 276 *et passim*]. An analysis of the toxicological information obtained by the comparison of chlorinated chemicals with their unchlorinated mother substances failed to show any rule governing the relationship between position of substitution and toxicity, the latter being apparently unpredictable on the basis of the structure of the chemical. Of the substances tested, 2, 3, 4, 6-tetrachlorophenol, 2, 4, 5-trichlorophenol, and 2-chloro-orthophenylphenol and the sodium

salts of these chemicals showed the highest degree of toxicity to the organisms used in the tests.

AGUSTONI (ENRICA). **Osservazioni e ricerche sul 'nerume' del Cavolfiore.** [Observations and researches on Cauliflower black spot.]—*Riv. Pat. veg.*, xxv, 7–8, pp. 305–315, 1 pl., 1935.

During the winter of 1934–5 cauliflowers reaching market in Milan from various parts of Italy were severely affected by a black spot which spread so rapidly to the healthy plants in the consignments that it rendered the produce unsaleable. The affected heads bore numerous, minute, blackish-brown, velvety spots which enlarged and generally became confluent, covering a quarter or more of the surface. The diseased tissues were olivaceous-brown, moist, and malodorous, the discoloration extending up to half-way towards the interior, but not farther.

All the lesions contained numerous bacteria, the larger ones also showing the presence of *Alternaria brassicae* (Berk.) Sacc. [*R.A.M.*, xiv, p. 494]. The bacterium was motile, ovoid, Gram-negative, non-acid fast, 1·5 to 2·7 by 0·8 to 0·9 μ, forming on meat extract peptone agar pellucid, yellowish-white, superficial, round colonies with a sub-transparent, depressed, pale straw-coloured halo; it is identified as *Bacterium maculicola* [ibid., xi, pp. 146, 745].

Inoculations by means of a platinum needle of healthy cauliflowers with an aqueous suspension of the bacterium gave positive results, as did inoculations of wounded cauliflowers by sprinkling with the same suspension; similar inoculations with *A. brassicae* gave slighter infection. It is concluded that neither organism is capable of attacking perfectly healthy tissues directly, but that both enter the host through wounds set up by mechanical agency. The different forms of cauliflower black spot reported from time to time are regarded as all manifestations of one and the same disease which may develop in the field or during transport or storage.

RENARD (P.). **Une maladie du Chou : la hernie ou gros pied.** [A Cabbage disease: hernia or club root.]—*Vie agric. rur.*, xxiv, 37, pp. 167–169, 3 figs., 1935.

A popular note is given on club root of cabbage and other crucifers (*Plasmodiophora brassicae*) in France, where it is stated to have been first observed on cauliflowers near St. Malo in 1820, 84 years after its detection in England. Danish, German, Dutch, and Belgian workers are said to have obtained good control of the disease by the application to the soil of 300 to 500 kg. per hect. of calcium cyanamide [*R.A.M.*, x, p. 574; xi, p. 686; cf. also ibid., xiv, p. 807].

SHERWOOD (S. F.). **Sclerotium rolfsii, a fungus pest of California Sugar Beets.**—*Facts ab. Sug.*, xxx, 11, p. 427, 1935.

Referring to the occurrence of *Sclerotium rolfsii* as a major pest of sugar beets [cf. *R.A.M.*, xi, p. 349] in the central parts of California in 1931, 1932, and 1933, when losses exceeding 50 per cent. in large acreages of the crop were not infrequent (see 'Southern root rot on field crops in California' issued by the California College of Agriculture

Extension Service [mimeographed]), the writer states that the first definite identification of the disease was made in 1927 in the Sacramento Valley, the fungus having probably been introduced into the State from outside. The application to the soil of a dilute formaldehyde solution may be effective against the disease over a limited area, but for large-scale control the cultivation of resistant varieties is recommended. Care should be taken not to transport the fungus into disease-free districts by means of soil accumulating at beet dumps or adhering to waggons and equipment.

KOTILA (J. E.) & COONS (G. H.). **Boron deficiency disease of Beets.**—*Facts ab. Sug.*, xxx, 10, pp. 373–376, 4 figs., 1935.

Heart and dry rot of beets, hitherto reported only from Europe [*R.A.M.*, xv, p. 1], is stated to have developed in Michigan and Ohio. The typical symptoms of the disease as it occurs in the field were observed in young beet plants growing in crocks containing clean sand with a modified Knop's solution. The plants were removed from the sand and classified as 'injured' or 'apparently normal', and replaced in the sand in nutrient solutions with and without (*a*) boric acid and (*b*) phosphorus. After a month necrotic symptoms began to appear in all the jars not receiving boron, whereas at the end of 45 days nearly all the plants (both healthy and injured) supplied with boric acid were in sound condition. Phosphorus deficiency was apparently not a factor in the development of necrosis.

In a second series of cultures, 1 per cent. borax solution was added to glass sand and a nutrient solution in one-gallon crocks planted with sugar beet, at the rate of 0·0, 0·2, 1·2, 2·4, 4·8, and 9·6 c.c. per jar, these being the quantities computed to correspond to 0, 1, 5, 10, 20, and 40 lb. borax per acre. It was found that the 1 and 5 lb. per acre treatments were insufficient to prevent necrosis, whereas at and above 10 lb. no symptoms of disease developed. The most vigorous growth was made by the plants receiving the 20 lb. treatment.

Four roots from plants showing typical heart and dry rot symptoms in the field were used in another test. Two were cut in half lengthwise; one half was planted in a jar of sand with a nutrient solution with boric acid, this being omitted from the similar solution in which the other half was placed. The two other roots were planted in two other jars, one with and one without boric acid. After 35 days, wilting, dwarfing, and necrosis were all present on the plants in jars without boron, whereas the other plants were some 10 in. taller with a much better developed root system and no symptoms of necrosis.

A cursory survey of the affected regions showed the disease to be most prevalent in sandy or gravelly loam soils with a porous subsoil, the symptoms assuming a severe form in up to 15 per cent. of the stand and occurring in an incipient stage in at least 25 per cent. of the remainder.

PASSECKER (F.). **Der Shiitake oder Pasaniapilz (Cortinellus Shiitake P. Henn.).** [The shiitake or Pasania fungus (*Cortinellus shiitake* P. Henn.).]—*Z. Pilzk.*, xix, 2, pp. 58–59, 1 fig. on Pl. 7, 1935.

A German description is given of *Cortinellus shiitake* P. Henn. [see next abstract], the fructifications of which were obtained in pure culture

in the writer's laboratory in Vienna from a consignment of spores from Japan, where (as also to some extent in China) the mushroom is stated to be extensively cultivated and greatly prized for culinary purposes. There seems to be no reason why *C. shiitake* should not become naturalized in Central Europe.

HIROE (I.). **Establishment of applied Mushroom science in Japan.**—*Appl. Mushroom Sci.*, i, 1, pp. 1–5, 6 figs., 1935.

'Applied mushroom science' is understood by the author as a branch of applied mycology comprising morphological, physiological, ecological, and systematic researches on mushrooms, methods of cultivation and utilization, problems of sanitation, and the like, which are to be investigated at the Tottori Agricultural College, where special facilities have been made available. The journal, of which the present is the first issue, is designed to extend the knowledge of this subject, and for the benefit of foreign readers it is proposed to furnish English summaries. The number of species of edible mushrooms in Japan is estimated at over 140 [see next abstract], some of which have been cultivated from early times. These include the pine mushroom (*Armillaria mellea*) or matsutake [*R.A.M.*, xiv, p. 284], *Cortinellus shiitake* P. Henn. [see preceding abstract] (shii-take), and *Collybia velutipes* (enoki-take), and the nameko group [ibid., xiii, p. 287], including *Pholiota adiposa* [see above, p. 68], *P. mutabilis*, *Auricularia auricula-judae* [ibid., vi, p. 127] (kiku-rage), and *Pleurotus ostreatus* [ibid., xii, p. 343] (hira-take).

HIROE (I.). **List of edible Mushrooms in Japan.**—*Appl. Mushroom Sci.*, i, 1, pp. 24–29, 1935. [Japanese.]

An alphabetical list is given of the scientific names of the 137 species of edible fungi recognized in Japan [see preceding abstract].

GOLDING (F. D.). **A probable vector of Cassava mosaic in Southern Nigeria.**—*Trop. Agriculture, Trin.*, xii, 8, p. 215, 1935.

When 814 adult individuals of the Aleyrodid *Bemisia nigeriensis* Corbett collected from mosaic cassava [see below, p. 76] in the field in Southern Nigeria were introduced during the period 21st March to 8th April, 1935, into a cage containing two healthy and two mosaic cassava plants, mosaic symptoms appeared on 9th April on two young leaves of one of the healthy plants, though two healthy cassava plants in a control cage kept free from the insects showed no sign of the disease [*R.A.M.*, xiv, p. 217]. This result indicates that the Aleyrodid can transmit cassava mosaic and it is hoped to confirm this by additional evidence.

Plantesygdomme i Danmark 1934. Oversigt, samlet ved Statens plantepatologiske Forsøg. [Plant diseases in Denmark in 1934. Survey of data collected by the State Phytopathological Experiment Station.]—*Tidsskr. Planteavl*, xl, 5, pp. 713–766, 11 figs., 2 graphs, 1935. [English summary.]

This report, compiled by E. Gram and his collaborators, follows the usual lines [*R.A.M.*, xiv, p. 78]. White tip (reclamation) disease (chiefly of oats) [ibid., xii, p. 656, and below, p. 86] is stated to be

declining in Denmark owing to the general use of copper sulphate in affected soils. The abnormally dry conditions prevailing over most of the country in 1934, especially during July, favoured unusually severe outbreaks of grey speck in rye, wheat, barley, oats, beets, potatoes, and cocksfoot grass [*Dactylis glomerata*], the beneficial effects of manganese sulphate on which [ibid., xiv, p. 677; xv, p. 8 and below, p. 87] have been found to persist for three years.

A characteristic disturbance of swedes and turnips involving a dark discoloration and rotting of the vascular bundles is provisionally attributed to the agency of bacteria, which were isolated in profusion from the diseased material. There was some indication that stable manure is a factor in the spread of infection.

The risk of infection by the ascospores of the apple scab fungus (*Venturia inaequalis*) was observed during four years' investigations to be greatest from the first emergence of the flower buds until the end of blossoming [cf. ibid., xiv, pp. 589, 590].

Two bacterial diseases of ornamentals new to the country are reported. Cineraria [*Senecio cruentus*] leaves bore dark, circular or angular lesions up to 0·5 cm. in diameter, mostly surrounded by a pale margin, and containing numerous bacteria. Control was obtained by spraying with 50 gm. sanagran [ibid., xiii, pp. 151, 204] plus 65 gm. isinglass in 100 l. water. Greenhouse hydrangea leaves were also attacked by a bacteriosis in the form of light or dark pale-bordered lesions, with numerous minute spots along the leaf margins.

VAN POETEREN (N.). **Verslag over de werkzaamheden van den Plantenziektenkundigen Dienst in het jaar 1934.** [Report on the work of the Phytopathological Service in the year 1934.]—*Versl. PlZiekt. Dienst Wageningen*, 80, 108 pp., 2 pl., 1935.

This report, prepared on the usual lines [*R.A.M.*, xiv, p. 11], contains the following among many other interesting items. Oats seedlings submitted for inspection from Zealand bore the brown longitudinal stripes characteristic of *Helminthosporium avenae* [ibid., xiv, p. 690], which is stated to be more prevalent than commonly believed. The application to wheat crops, while moist, of manganese sulphate [see preceding abstract] caused a brown discoloration of the foliage. Both wheat and barley in plots receiving no potash suffered more severely from mildew (*Erysiphe graminis*) [ibid., xv, p. 9] than in those supplied with this element.

'Pseudo-wart disease' of potatoes, characterized by the outgrowth from the eyes of excrescences resembling those of true wart [*Synchytrium endobioticum*], was found to be due to the formation of numerous shoots remaining in an arrested state of development.

Large, greyish-brown, somewhat swollen lesions on the trunks of young standard apple trees were found to contain the pycnidia of *Phomopsis mali* [ibid., xv, p. 33]. Among the substances tested for the control of apple and pear scab [*Venturia inaequalis* and *V. pirina*], Bayer's Bordeaux (1 per cent.) gave encouraging though not entirely uniform results. Tested on Manx Codlin apples the standard Bordeaux gave the highest percentage of scab-free fruit (97·3), though it caused severe injury [ibid., xv, p. 36]. Shirlan A.G. (0·4 per cent.) [ibid.,

xiv, p. 9] was ineffective while para Bordeaux (1·25 per cent.) combated the disease but caused very severe injury. Brown spots in the cortex of pears contained *Gloeosporium* [*Neofabraea*] *malicorticis* [ibid., xiv, p. 12], a virulent parasite of this host. *Nectria galligena* was prevalent on pear fruits in the shape of circular, brown, necrotic lesions. *Microstroma juglandis* [ibid., ix, p. 275] was reported on walnut from two localities in a mild form.

Hard-husked scarlet runners [*Phaseolus multiflorus*] are stated to be normally more resistant to rust (*Uromyces appendiculatus*) [ibid., xiv, p. 734] than those of softer texture, but a weakening of this property appears to have occurred in the Erecta variety, leading to infection during the period under review.

Lime trees were attacked, and in some cases totally defoliated, by *Gloeosporium* [*Gnomonia*] *tiliae* [ibid., viii, p. 289]. Willows, especially of the 'grey' type [*Salix caprea* or *S. cinerea*], in an experimental planting at Neerlangbroek (Utrecht), were infected by *Physalospora miyabeana* [ibid., xiv, p. 479]. A severe die-back of another variety is tentatively attributed to a species of *Fusarium* which was consistently isolated from the dead branch tips.

F. nivale [*Calonectria graminicola*], one of the agents of 'brown patch' of golf-greens [see below, p. 102], was very satisfactorily controlled at Noordwijk by a mixture of 60 gm. calomel [mercurous chloride] and 30 gm. mercuric chloride per sq. m. strewn evenly over the affected surface.

Fruits of an undetermined species of *Polygonum* found among the refuse of a summer wheat crop were infected by *Ustilago utriculosa* [ibid., xii, p. 277], which thus performs a useful service in suppressing the propagation of the weed. Another valuable fungus is the parasite (*Darluca filum*) [ibid., xi, p. 91] of willow rust (*Melampsora* sp.) [ibid., xi, pp. 139, 157, 412], which considerably reduced the virulence of the disease in 1934.

Promising results were given by the treatment of Glory, Mansholt, and Zelka pea seeds showing 11 to 24 per cent. infection by *Ascochyta* [ibid., xii, p. 483] with 2 per cent. ceresan liquid, ceresan dust, and abavit universal [ibid., xiv, p. 20, and below, p. 83], the two last at the rate of 2 gm. per kg.

Good control of hop downy mildew (*Pseudoperonospora humuli*) [ibid., xiv, p. 792] in the newly established plantings at Amerongen and Rhenen has been obtained by the application of nosperit [ibid., xiv, p. 659], which is apparently used on a large scale in Belgium for this purpose.

Details are given of a number of local tests of various standard and proprietary fungicides, of which the following may be mentioned. 'Damping-off' of dahlia cuttings [*Pythium de Baryanum* and other fungi] was very satisfactorily combated by soil sterilization with aretan at the rate of 8 l. per sq. m. of a 0·25 per cent. solution, or by immersion of the cuttings in a 0·125 per cent. solution, the incidence of infection among untreated plants in infested soil being 75 per cent. Shirlan A.G., though not completely effective against *Cladosporium fulvum* on tomatoes, maintained the plants in good health for a much longer period than the untreated controls. Mercuric chloride (1 in 1,500) is

stated to be coming more and more into use for the disinfection of potting soil against *Rhizoctonia* [*Corticium*] *solani*, a parasite of various ornamentals such as cacti, *Bouvardia*, and *Cyclamen* [*persicum*]; care should be taken to pour clean water over the leaves of the last-named and other sensitive plants to avoid the risk of scorching.

Laboratorio de Criptogama. [Cryptogamic Laboratory.]—*Mem. Trab. Estac. Fitopat. Agríc. Coruña 1934*, pp. 35–41, 1935.

The following are among the items of interest in this report. *Armillaria mellea* appears to be only one of the factors involved in the root rot and consequent desiccation of vines and fruit-trees [*R.A.M.*, xiii, p. 745] throughout Galicia, Spain, the others being as yet unknown.

Heavy damage is caused to the Galician maize crop by *Gibberella moniliformis* [ibid., xiv, pp. 297, 493] in its conidial stage (*Fusarium moniliforme*) both in the field and in storage under conditions of extreme humidity and high temperature. The germination of diseased grain in sterilized soil with severe, slight, and no external symptoms was reduced in each lot by 100, 80, and 40 per cent., respectively. Healthy seed-grain sown in infected soil germinated to the extent of 90 per cent., while 100 per cent. germination was obtained with seed from apparently sound ears from diseased plots. The last lot, transferred to test-tubes on Sachs's liquid medium on 28th March, showed slight symptoms of infection on 16th April, and on 2nd May the fungus was observed in the decaying roots.

Nectria galligena was isolated from pear [see preceding abstract] and *Macrophoma reniformis* [*Physalospora baccae*: ibid., vi, p. 81] from vine. 'False black root' of vine, caused by *Guignardia baccae* (Cav.) Jacz., occurred in its pycnidial (*Macrophoma*) stage on plants suffering from anthracnose (*Gloeosporium ampelophagum*) [ibid., xiv, p. 616]. *Venturia cerasi* [ibid., xiv, p. 589] was reported on cherries from La Coruña, where it is believed to be widespread.

Mycosphaerella pinodes [ibid., xiv, p. 613] caused heavy damage to peas.

Chestnuts in the province of Lugo were severely injured in 1934 by the leaf spot due to *Phyllosticta maculiformis* [ibid., xii, p. 252], which appears to be favoured by a southern exposure.

Stell (F.). **Report of Mycologist, 1935.**—*Rep. Dep. Agric. Trin. Tob. 1934*, pp. 47–50, 1935.

The following items of interest occur in this report [*R.A.M.*, xiv, p. 13]. No appreciable economic loss now results from sugar-cane mosaic in Trinidad [ibid., ix, p. 131], but the disease is still present in the northern and central cane belts. Spread is due chiefly to the planting of infected cuttings, and systematic roguing keeps the disease well in hand.

Owing to increased planting, Panama disease of bananas (*Fusarium* [*oxysporum*] *cubense*) has recently become considerably more prevalent [ibid., xiv, pp. 13, 181]. Some estates have a fairly high incidence of infection even among plants producing the first crop, and scattered failing stools are found almost everywhere.

Gros Michel bananas were attacked by 'moko' [*Bacterium solanacearum*: ibid., xiv, pp. 155, 181], especially in lands recently cleared

from high woods. Typically, leaf symptoms are almost absent, but on affected plants which possess fruit bunches individual fingers here and there show a characteristic premature yellowing and the fruit stalks have discoloured vasculars. B.D.K. oil is now the stock treatment for killing off the diseased stools; in comparative tests with various chemicals this oil gave the best results, though sodium arsenite (1 lb. per gall. of water) was fairly effective.

In certain districts cacao witches' broom (*Marasmius perniciosus*) [ibid., xiv, pp. 13, 155] has become more prevalent and severe. At the Government Estate at Marper the loss of mature pods in 1933 amounted to about 1 per cent. of the total crop; in 1934, the figure was about 2 per cent. All diseased material is destroyed on this estate once a month, the cost of this work being at present uneconomic. It is safe to say that losses of 5 to 10 per cent. are common in some districts; on some properties the losses sustained are probably appreciably higher. During 1934, 150,000 cacao trees growing on some 500 acres in the most severely infected areas were examined to determine the incidence of the disease; subsequent monthly inspections were made to ascertain if any trees showed high resistance or immunity. By the middle of the year it was found that 108 quarter, 81 half, and 132 full trees, making 321 in all, were still unaffected, but at the end of the year the total figure had fallen to 92 (comprising 29 quarter, 17 half, and 46 full trees); it was anticipated that a large percentage of the healthy trees would become infected within a few months. Small nurseries have been established in certain localities from pods selected from highly resistant trees.

The characteristic and dominant shade trees in the cacao fields are the immortels known locally as bocare [*Erythrina velutina*] and anarca [*E. umbrosa*], the former being found chiefly in low-lying areas and the latter at higher elevations. Both are liable to diseases caused by various environmental factors and also to infection by a species of *Sphaerostilbe*. Fructifications of the fungus (*Stilbum* and perithecial stages) are conspicuously present, but the organism has not attacked cacao. The treatment recommended for the dead trees consists in scorching the areas where the fructifications are visible, and afterwards felling and burning. If replacement is desired, *Gliricidia* sp. or some trees other than immortels should be planted.

Miles (A. C.). **Report on the Department of Agriculture, Gold Coast, for the year 1934–35.**—17 pp., 1935.

This report contains, *inter alia*, the following items of phytopathological interest. Encouraging results have been obtained on the Gold Coast in breeding types of cassava resistant to mosaic [see above, p. 72]. Germination of the seeds was at first slow and uncertain, but the use of a solar propagator increased the germination percentage considerably and reduced the time required for germination to take place from about six weeks to a fortnight. Of 95 seedlings so far produced, 36 are over nine months old and have shown no natural infection by mosaic, while 12 of the latter remained unaffected when artificially infected by budding from infected stock. In one small test with cuttings from 20 of the new seedlings, 10 (of which 4 had remained unaffected after artificial

infection) remained free from mosaic under field conditions. More extensive tests are required before definite conclusions as to the immunity of these types can be reached, as experience has shown that cassava varieties brought from lightly to heavily infected areas may show at first an apparent immunity which is not maintained after one or two seasons' exposure to infection in the new environment.

Experimental evidence demonstrated that although properly dried cacao exhibits a definite equilibrium between its water content and the relative humidity of the air, this normal equilibrium breaks down once active mould formation begins, even though the cacao may afterwards be dried to 8 per cent. water content, above which point mould growth is induced [*R.A.M.*, ix, pp. 163, 164]. The effect of the moulds is to change the water-absorbing properties of the cacao, so that in an atmosphere safe for the storage of cacao free from moulds actively mouldy produce will continue to absorb moisture beyond the normal equilibrium point, with the result that moulding proceeds progressively.

Tobacco leaf curl was introduced to the Gold Coast during the period under review on the seed of Bourbon tobacco from Mauritius. The seed had been distributed in the Eastern Province before the disease was observed and complete eradication from this area will be difficult. Streak was noted on sugar-canes imported from South Africa and the affected plants were immediately destroyed. Citrus scab [*Sporotrichum citri*] was also introduced on material from South Africa; its occurrence was not noted for some time but measures for its control are being vigorously prosecuted.

Narasimhan (M. J.). **Report of the Mycological Section for the year 1933–34.** *Admin. Rep. agric. Dept. Mysore 1933–34*, pp. 19–22, 1935.

Further spraying tests in Mysore against areca palm [*Areca catechu*] koleroga [*Phytophthora arecae*: *R.A.M.*, xiii, p. 682] showed that the addition of groundnut oil to Bordeaux mixture (at the rate of $\frac{1}{4}$ gall. oil to 100 galls.) improved the physical character and efficacy of the latter, not one tree in the 30 gardens sprayed with the oil-Bordeaux mixture becoming affected, though the disease reappeared in areas sprayed with casein Bordeaux. It is hoped that the use of groundnut oil will supersede casein, which at present is imported into Mysore at an annual cost of nearly Rs. 40,000 [£3,000].

An obscure disease of *A. catechu*, known locally as 'hidimundigeroga', and hitherto supposed to be of physiological origin, was ascertained to be associated with a longitudinal fissure in the crown extending from the top of the stem to a portion of the bud. Growth becomes arrested. No wound is visible externally, the injury becoming apparent only after the removal of two or three leaf sheaths. The inflorescences are affected and start to decay as they are formed, diseased trees probably never bearing fruit. The crown dries up within six to eight months without the internal injury becoming manifest.

Sporadic cases were noted of a marasmioid thread blight on coffee somewhat similar to, but not identical with, the 'Javanese cobweb' disease [ibid., viii, p. 777].

In further spraying tests against *Alternaria* disease of potatoes [*A. solani*: ibid., xiii, p. 683] promising results were given by a mixture of 1 lb. calcium arsenate in 50 galls. water, with lime-caseinate spreader.

Chrysanthemum rust [*Puccinia chrysanthemi*] was widely prevalent at Malur, the chief centre of chrysanthemum-growing in Mysore, and later was also very common in all the chrysanthemum fields round Bangalore. The disease generally appears when the crop is about to bud, assuming an epidemic form as flowering begins; finally the whole plant dries up.

Betel nut [*Piper betle*] sprayed with Bordeaux mixture (½ per cent.) plus casein or oil, or oolite sulphur developed less mildew [? *Oidium* sp.: ibid., xiii, p. 682] than unsprayed plants, only the new leaves becoming affected.

Other records include *Corticium salmonicolor* on coffee, *Phyllosticta* sp. on cucurbit leaves, *Corticium vagum* [*C. solani*] on beet, *Diplodia* die-back [? *D. natalensis*] of limes, *Cercospora* sp. on sesame, and *Alternaria* sp. on gori (*Cyamopsis psoralioides*).

Thompson (A.). **The Mycological Division.**—*Rep. Dep. Agric. F.M.S., 1934*, pp. 61–63, 1935.

The following items, apart from those already noticed from other sources, are included in this report. An investigation of oil palm stem rot [*Fomes noxius*: *R.A.M.*, xiv, pp. 81, 791] showed that in Malaya the fungus does not normally penetrate into the inner stem tissues until a moderately large area of outer stem has become affected, and the treatment of suspected cases can therefore be delayed until definite symptoms have been observed. An oil palm root disease associated with *Ustulina zonata* was recorded in Malaya early in 1934. No external symptoms became apparent until an advanced stage had been reached. *Poria ravenalae* was associated with premature withering of the lower leaves of a group of oil palms the roots of which were decayed; abnormally dry soil conditions appeared to favour the disease.

About 60 areca palms [*Areca catechu*] growing near a wire fence were injured by lightning, 20 fatally; the remainder appeared to recover, but about eight months later some showed stem bleeding accompanied by borer attack [cf. ibid., xii, p. 506]. *Ganoderma lucidum* was found on the stems of the same host.

The most serious tobacco disease was again *Bacterium solanacearum* [ibid., xiii, pp. 216, 657; xiv, p. 659; see also below, p. 111]; losses ranged from 43 to 100 per cent. on White Burley and Joyner varieties. The presence of tobacco mosaic was confirmed by transmission experiments with juice from mottled, blistered, and distorted leaves. Differences in the symptoms produced indicated the presence of more than one virus.

A comparison of cultures from 'red root' of tea in highland and lowland areas indicated that in Malaya two fungi may be responsible for those root diseases of tea in which the common symptom is the production of red rhizomorphs on the outside of the roots. The fungus present on the lowland tea was *G. pseudoferreum* [ibid., xii, p. 248], while that on the highland tea resembled *Poria hypolateritia* [ibid., xiii, p. 216]. Root disease of tea from both localities was caused by *U. zonata* [ibid., x, p. 160].

Pseudomonas citri was isolated from grapefruit leaves from the Cameron Highlands, and was shown to be pathogenic to grapefruit and limes.

Potato blight (*Phytophthora infestans*) was recorded for the first time in Malaya in three holdings in the Cameron Highlands. The meteorological records from this area indicate that the local weather conditions are suitable for the propagation of the fungus throughout the year. *Alternaria* blight [*A. solani*] affected backward potato plants in the same district.

A dwarfing of *Crotalaria anagyroides* associated with leaf mottle and chlorosis was also investigated.

Fifty-third Annual Report of the Ohio Agricultural Experiment Station 1933–1934.—*Bull. Ohio agric. Exp. Sta.* 548, 120 pp., 13 figs., 4 graphs, 1935.

The following items of interest, apart from those noticed from other sources, occur on pp. 32–38 of this report [cf. *R.A.M.*, xiii, p. 684]. Alexander found that in tests of seedlings of 180 tomato varieties for resistance to *Septoria* [*lycopersici*] all the varieties became heavily infected, with the exception of an occasional, very much stunted plant, and when potted plants of these varieties were tested again, they all developed very severe infection [ibid., xii, p. 11].

Tilford reports that the yields of potato plots sprayed throughout the season with the high- and low-lime Bordeaux mixtures 4–6–50 and 5–2½–50 were, respectively, 359·8 and 367·1 bushels per acre, as against 317 for a set of plots sprayed at a concentration of 8–4–50 for the first application, 6–3–50 for the second, 4–2–50 for the third to the seventh, and 2–1–50 for the eighth; the unsprayed controls yielded 200 bushels per acre.

Treatment of four varieties of gladiolus corms against scab [*Bacterium marginatum*: ibid., xii, p. 356; xiii, p. 168] by immersion for five minutes in calogreen (1 oz. per gall. water), or the same plus mercuric chloride (1 in 1,000), or for 2 hours in mercuric chloride alone (1 in 1,000) gave, respectively, 80·6, 83·2, and 60 per cent. clean corms, as against only 24·5 per cent. in the untreated controls.

So far 11 elms affected with Dutch elm disease [*Ceratostomella ulmi*: ibid., xiv, p. 726, and below, p. 125] have been noted in the state of Ohio. Confirmation of the discovery by Miss Buisman of the perithecial stage [ibid., xi, p. 409] was obtained by Swingle, and wound inoculations of healthy American elms with ascospores of the fungus gave positive results.

Mallamaire (A.). **French West Africa: diseases of plants cultivated in the Ivory Coast.**—*Int. Bull. Pl. Prot.*, ix, 9, pp. 198–200, 1935.

A list is given of the fungi (mostly well-known), bacteria, and nematodes occurring on industrial trees and shrubs [cf. *R.A.M.*, xv, p. 16], fruit and food crops, leguminous cover plants, and vegetables in the Ivory Coast.

Camus (J. S.). **Annual Report of the Director of Plant Industry for the fiscal year ending December 31, 1934.**—103 pp., 19 pl., 1935.

In the section on plant pathology (pp. 76–80) of this report, the

following items, *inter alia*, are noted. The causal organism of citrus *Phytophthora* blight in the Philippine Islands was identified as *P. faberi* [*P. palmivora*: *R.A.M.*, xiv, p. 627]. Grapefruit was unaffected, but Siamese seedless pomelo, Batangas mandarin orange, Villafranca lemon, Washington Navel orange, and King mandarin orange were badly diseased. A species of *Pythium* was associated with a serious tissue rot of the bark and outer portions of mango roots.

Of thirteen abaca [*Musa textilis*] varieties so far tested, Sinibuyas, Kinalabao, and Putian showed high resistance to bunchy top [ibid., xiv, p. 37]. Immature fruits of Latundan, Gloria, and Saba bananas affected by black tip invariably yielded a fungus closely resembling *Helminthosporium torulosum* [ibid., xiv, p. 323].

Preliminary studies indicate that cotton leaf curl is spread locally by cotton leafhoppers [*Empoasca flavescens*]. Cotton leaf spot (*H. gossypii*) is present in Manila and Silang, where it may have been introduced on imported seed. A virulent outbreak of tobacco bacterial wilt (*Phytomonas solanaceara*) [*Bacterium solanacearum*: see above, p. 78] attacked 90 per cent. of the plants in the Economic Garden, Los Baños, Laguna.

Strawberry root stocks from the Baguio Semi-Tropical Fruit Station were attacked by a serious disease due to a *Fusarium*, which destroyed 95 per cent. of the plants when planted at lower altitudes; fungicidal disinfection of the root stocks reduced the effects of the disease.

Black smut of rice (*Tilletia horrida*) [ibid., xiv, p. 222] retarded growth and markedly reduced the yield and market quality of the rice. It prevails only in irrigated fields, and plants become predisposed to it when planted during the dry season. The *Fusarium* rice disease recently reported [ibid., xiv, p. 120] is not widespread and can be controlled by roguing and the destruction of the affected plants.

Breed (R. S.) & Brooks (R. St. J.). **Report on proposals submitted by R. E. Buchanan and H. J. Conn relative to the conservation of Bacillus as a bacterial generic name, fixing of the type species and of the type or standard culture.**—*Zbl. Bakt.*, Abt. 2, xcii, 24–26, pp. 481–490, 1935.

In accordance with the resolution of the Paris Congress of the International Society of Microbiology, 1930, the Nomenclature Committee was duly appointed by the individual National Committees of the Society, and invitations to serve on the Committee were extended to the members of the Sub-Committee on Bacterial Nomenclature of the International Botanical Congress. In January, 1931, a proposal was made by R. E. Buchanan for the conservation of *Bacillus* as a generic name, supplemented by a recommendation by H. J. Conn for the retention of the 'Marburg' strain of *B. subtilis* as the type strain. An analysis of the expressions of opinion by members of the Committee on these proposals revealed an over two-thirds majority in favour of them, further action on which may therefore be taken if deemed advisable at the forthcoming Second International Congress for Microbiology in London in July, 1936.

The resolutions of the Nomenclature Committee on the above-mentioned proposals are therefore as follows: The Committee agrees that (1) *Bacillus* Cohn, 1872, should be designated as a *genus conser-*

vandum; (2) the type species should be known as *B. subtilis* Cohn, 1872; (3) the type (or standard) strain should be the Marburg strain; (4) the type (or standard) strain of *B. subtilis* Cohn, 1872, together with a complete description, should be maintained at each of the recognized type culture collections; (5) the genus *Bacillus* should be so defined as to exclude bacterial species not producing endospores; (6) the term *Bacillus* should be used as a generic name and differentiated from the term 'bacillus' as a morphological description.

Details of the proposals are set forth in eight appendices.

LEBEZHINSKAYA (Mme V. D.). К методике выделения фитопатогенных бактерий. [On the methods of isolation of phytopathogenic bacteria.]—*Микробиол.* [*Microbiol.*], iv, 2, pp. 254–257, 1935. [English summary.]

The following facts were ascertained in the course of work at the U.S.S.R. Plant Protection Institute on isolation methods for phytopathogenic bacteria. Warm water was superior to alcohol for the preliminary treatment of the material while mercuric chloride (1 in 1,000) was the best of the disinfectants studied. Omeliansky's medium with the addition of glucose and gentian violet [*R.A.M.*, xiv, p. 758] proved to be the most suitable for the isolation of the organisms used in the trials. The percentage of positive results was increased by the preliminary grinding of the material under observation in a mortar with sterile water.

KHUDIAKOFF (J. P.). Литическое действие почвенных бактерий на паразитные грибы. [The lytic action of soil bacteria on parasitic fungi.]—*Микробиол.* [*Microbiol.*], iv, 2, pp. 193–204, 7 figs., 1935. [English summary.]

Two species of bacteria, a *Pseudomonas* and an *Achromobacter*, capable of inducing lysis in *Fusarium* spp. and certain other fungi, were studied at the Moscow Microbiological Institute and methods for their rapid isolation in pure culture elaborated. These organisms are widespread in various soils, but they are also absent from a considerable number, including those in which flax exhaustion, associated with *F. lini*, is prevalent [*R.A.M.*, xiv, p. 635]. *F. lini*, introduced into soils containing active lytic bacteria, fails to develop, nor does the inoculation of such soils with the organism result in wilting of the plants. Wheat is protected from attack by *F. graminearum* [*Gibberella saubinetii*] in soil inoculation tests by the simultaneous introduction with the fungus of the lytic bacteria, the same effects ensuing if the latter are incorporated with the soil 24 hours earlier. Other species of *Fusarium* undergoing lysis by these bacteria were *F. herbarum*, *F. equiseti*, *F. scirpi* [ibid., xiii, p. 593], and *F. culmorum*, besides *Botrytis cinerea* and *Sclerotinia* sp.

HAVAS (L.). **Follicular (oestrus) hormone and plant tumours.**—*Nature, Lond.*, cxxxvi, 3439, p. 516, 1935.

Previous experiments having indicated that female sex hormones produce marked effects on certain plants, an aqueous solution of commercial crystalline follicular hormones was introduced through a petiolar stump into tomato plants, which were subsequently inoculated

above and below the petiole with *B*[*acterium*] *tumefaciens*. The average weights of the resultant tumours per plant in the 31 plants so treated were 0·303 gm. below the petiolar stump and 0·554 gm. above it (an increase of about 80 per cent.), the corresponding figures for 21 controls injected with distilled water being 0·427 and 0·452 gm., and for ten receiving hormone-free extract of animal tissue 0·423 and 0·407 gm., respectively.

Wilson (A. R.). **The influence of Phytomonas tumefaciens and Phytomonas rhizogenes on the actual acidity of certain liquid and agar substrata.**—*Phytopathology*, xxv, 9, pp. 854–863, 2 graphs, 1935.

A detailed account is given of the studies conducted at Wisconsin University on the changes induced by the growth of the crown gall (*Phytomonas* [*Bacterium*] *tumefaciens*: one pathogenic strain and one non-pathogenic) and hairy root (*P.* [*Bact.*] *rhizogenes*) [*R.A.M.*, xiv, p. 289] organisms in carrot and yeast infusion-glucose-mineral salts agar and liquid media at 26° to 32° C.

Both organisms were found to induce more rapid changes in P_H value in agar than in liquid media. In yeast infusion-glucose-mineral salts agar *Bact. tumefaciens* produced little alteration in reaction, whereas *Bact. rhizogenes* caused a speedy fall, followed by an almost equally rapid rise; in the corresponding liquid medium the latter brought about a continuous fall. In carrot infusion media a rise in P_H value occurred in cultures of all these strains. The non-pathogenic strain of *Bact. tumefaciens* differed from the pathogenic one only in the production of slightly more acid in the yeast infusion-agar medium, similar results being obtained both at 26° and 32° (respectively below and above the critical maximum temperature range for crown gall infection) [ibid., v, p. 348]. Free ammonia was formed both on liquid and agar carrot infusion and yeast infusion-glucose-mineral salts by *Bact. rhizogenes*, and on liquid carrot infusion alone by *Bact. tumefaciens*. This process is thought to be the cause of the rapid rise in P_H value in the carrot infusion cultures; the subsequent fall, where such occurs, is possibly due either to reduced ammonia production coupled with the formation of carbon dioxide or other acid substances from the medium, or to the utilization of ammonia by *Bact. tumefaciens* [cf. ibid., xv, p. 5].

Knapp (A. W.). **Scientific aspects of Cacao fermentation.**—*Bull. imp. Inst., Lond.*, xxxiii, 1, pp. 31–49; 2, pp. 147–161; 3, pp. 306–319, 4 pl., 3 figs., 1 diag., 1 graph, 1935.

The author gives a detailed and fully documented account of the process of cacao fermentation as carried out in various countries, including West Africa, the West Indies, Ceylon, Dutch East Indies, Porto Rico, Haiti, and San Domingo, and surveys the work already accomplished as well as the field for further research in this important branch of the industry. The micro-organisms found on fermenting cacao are discussed in some detail [*R.A.M.*, xi, p. 31; xiv, p. 224], particularly in relation to temperature; a succession of changes occurs in the flora during the course of fermentation. The subject of mould damage, the most serious of all defects of the bean, is reviewed both

with reference to the moulds occurring during fermentation and those developing after drying [see above, p. 77]. In the final section the biochemical aspects of the pulp and sweatings are noticed.

BECKER (K. E.). **Das Wichtigste zur Herbstbeizung.** [The essentials of autumn disinfection.]—*Dtsch. landw. Pr.*, lxii, 36, pp. 437–438, 1935.

In connexion with some general directions for the autumn treatment of cereal seed-grain, the writer calls attention to some important changes in the authorized German preparations [*R.A.M.*, xv, p. 6], chief among which is the restriction of the term 'universal' to those applicable to wheat, barley, oats, and rye. The abavit-universal dust [see above, p. 74] thus becomes merely abavit-u., while the universal dust ceresan will still be known simply as ceresan dust. The preparations known as betanal liquid [ibid., xii, p. 306], sublimoform [ibid., xii, p. 305], and drawin have been withdrawn from the official catalogue. Preference should as a general rule be given to the 'universal' preparations (viz., abavit-nassbeize Schering, ceresan nassbeize U. 564, fusariol 157, germisan and uspulun universal, and universal dust ceresan U.T. 1875 a). The advantages and drawbacks of the various methods of treatment (immersion, sprinkling, short disinfection process, and dusting) are briefly discussed and the most suitable disinfectants for use, with directions for their application, in each case indicated.

SIBILIA (C.). **Ricerche sulle ruggini dei cereali. La specializzazione della 'Puccinia triticina' Erikss. in Italia.** [Researches on cereal rusts. The specialization of *Puccinia triticina* Erikss. in Italy.]—*Boll. Staz. Pat. veg. Roma*, N.S., xv, 2, pp. 277–300, 4 figs., 1 map, 1935.

Between April, 1934 and May, 1935 the author made 24 collections of *Puccinia triticina* from different parts of Italy. Inoculation experiments on eight standard wheat varieties showed that the collections consisted of nine physiologic forms [*R.A.M.*, xiv, pp. 227, 496, 748], eight of them new, viz., four collections from Turin belonged to form LV, two from Milan to LVI, one from Bari and two from Brescia to LVII, seven from Padua, Sassari, and Barcellona (Messina) to LVIII, one from Ancona to LIX, one from Campotosto and two from Rome to the well-known form XV [*R.A.M.*, xiii, p. 689], another from Campotosto to LX, one from Caserta to LXI, and one from Cerignola to form LXII. This distribution is clearly shown on a map.

Forms LV, LVI, LVII, LIX, and LXI were moderately virulent, and only a few of the eight wheats tested (particularly Malakoff) showed resistance to them. Forms XV, LVIII, LX, and LXII produced no serious infection on any variety, the least virulent form being XV, which produced a fairly high degree of infection only on the Mediterranean and Democrat varieties. Forms LVIII, LX, and LXII were of medium virulence, producing heavy infection on four varieties. Form LX (from Campotosto) was remarkable in that it produced maximum infection on the resistant Malakoff variety, as well as on Webster, though form XV, also from Campotosto, did not infect either variety. Of the wheats tested only Mediterranean showed maximum infection by all the forms; Malakoff completely resisted infection by

all except forms LX and LIX. The methods and apparatus used in the work are described in detail.

Sibilia (C.). **Le forme ecidiche del 'Berberis aetnensis' Presl.** [Aecidial forms on *Berberis aetnensis* Presl.]—*Boll. Staz. Pat. veg. Roma*, N.S., xv, pp. 355–362, 4 figs., 1935.

In June, 1935, *Berberis aetnensis* growing on Mount Etna showed the presence of the aecidial sori of *Puccinia graminis* and of those of another species. The former, which affected large portions of the leaves and were also present on the leaf stalks, produced very numerous cylindrical aecidia, 580 to 600 μ high by 520 to 550 μ in diameter, while the aecidiospores measured 20 to 27 μ in diameter. The second species occurred only on the leaf blade, and produced small uredosori with a few aecidia measuring over 1 mm. long by 450 to 480 μ in diameter; the aecidiospores were 18 to 24 μ in diameter. The aecidiospores of *P. graminis* gave 8 to 10 and those of the second species 60 to 65 per cent. germination in water and agar. Inoculations on twenty varieties of wheat and one of rye with aecidiospores of the two species resulted in infection by *P. graminis* only, two wheat varieties developing uredosori after 13 days.

Mackie (W. W.). **Aeroplane dusting with sulphur to combat stem rust of Wheat.**—Abs. in *Phytopathology*, xxv, 9, pp. 892–893, 1935.

Very good control of stem [black] rust of wheat [*Puccinia graminis*] was obtained in the San Joaquin Valley, California, in 1935, by dusting with sulphur (25 lb. per acre) from aeroplanes, of which up to 13 were operating simultaneously [*R.A.M.*, xiii, p. 499]. The sulphur was passed through a 325-mesh screen before use. The work commenced at daylight and continued until about 9 a.m., and between 29th April and 14th May an area of 22,000 acres was covered. The most suitable period for the treatment was between the anthesis and hard dough stages (roughly three weeks). One application checked the attacks for about a week, while a second ten days later ensured an entirely satisfactory result.

Pittman (H. A.). **The rusts of cereals.**—*J. Dep. Agric. W. Aust.*, 2nd Ser., xii, 3, pp. 367–375, 5 figs., 1935.

In this semi-popular account of cereal rusts in Australia it is stated that stem [black] rust (*Puccinia graminis tritici*) has made the growing of wheat unprofitable in the coastal areas of New South Wales, but Western Australia suffers less from infection than any other part of the continent. It became epidemic in 1934 in the northern parts of the Australian wheat belt, the yield in many places being reduced by 75 to 80 per cent. The district worst affected is the humid Midland-Geraldton-Northampton coastal area. *P. simplex* [*P. anomala*] on barley has not yet been recorded in Western Australia.

Viennot-Bourgin (G.). **Contribution à l'étude des cryptogames de Seine-et-Oise (10e Note).** [A contribution to the study of the fungi of Seine-et-Oise (10th Note).]—*Rev. Path. vég.*, xxii, 3, pp. 181–199, 4 pl., 5 figs., 1935.

After referring to the rare records of *Ustilago tritici* attacking leaves

of wheat, the author describes in detail an infection of this character on a badly diseased plant of the Bon Fermier variety observed at Grignon in July, 1935. Compared with normally infected plants the ear was compressed, very short, and almost enclosed in the sheath, even at maturity. The most striking symptom was that the blade of the last leaf was either flat or rolled up into a spiral. From the last node to the tip of the blade stripes developed parallel to the veins, arising as a series of small, greenish-white swellings, sometimes agglomerated into warty nodules. On the blade, deep furrows appeared along which the leaves split into strips, edged by the exposed spores. Two of the six stalks showed no ear, the undeveloped ear being found below the third node, much reduced and not conspicuously smutted. Microscopic examination showed the mycelium to be actively developed in the foliar tissues, the formation of spores being observed in sacs which burst when the spores were mature.

An anatomical study of affected spikelets showed that the fungus attacks the glumes causing the formation of lesions between the veins, without first invading the ovary to any special degree. The paleae are very strongly attacked, only traces of the upper one being recognizable. The ovary is displaced, usually towards the lower palea, and at the base it bears numerous wart-like lesions allowing the spores to escape. The stigmas can be recognized as glandular structures with spine-like branches. The rapid development of the mycelium completely disorganizes the tissues.

NATTRASS (R. M.). **Smut diseases of cereals.**—*Cyprus agric. J.*, xxx, 3, pp. 77–78, 1935.

In this brief note the author gives a popular summary of the treatments applicable for the control of bunt [*Tilletia caries* and *T. foetens*] and loose smut [*Ustilago tritici*] of wheat, and loose and covered smuts of barley [*U. nuda* and *U. hordei*], which are stated to cause serious losses each year to cereal growers in Cyprus. Covered smut of barley is stated to be controllable by dusting the seed-grain with flowers of sulphur.

VOSBEIN (O.). **Können wir uns gegen die Fusskrankheit schützen?** [Can we guard against foot rot?]—*Mitt. Landw., Berl.*, l, 39, p. 827, 1935.

A brief account is given of the occurrence of foot rot in cereals (chiefly winter wheat) [attributed mainly to *Fusarium culmorum*: *R.A.M.*, xiii, p. 23] in the Kleinwanzleben (Magdeburg) district of Germany in relation to cultural practices. Particularly heavy damage was observed in 1935 in winter wheat following beets and potatoes, the pathogens having persisted in the soil since the previous wheat or barley stand by which root crops are almost invariably preceded [cf. ibid., xiv, p. 748]. Oats may safely be introduced into the rotation scheme, while infection will be gradually eliminated from the soil by the successive cultivation of root crops or lucerne. Deep ploughing-under of the diseased stubble is not a guarantee of good health in the next crop, for the fungi may easily be brought to the surface in a viable condition by cultural operations in time for reinfection. Late sowing

(end of November or early December for wheat and after 20th September for barley) is the most effective means of combating foot rot.

MITRA (M.) & BOSE (R. D.). **Helminthosporium diseases of Barley and their control.**—*Indian J. agric. Sci.*, v, 4, pp. 449–484, 2 pl. [1 col.], 4 graphs, 1935.

Spot blotch of barley (*Helminthosporium sativum*) [*R.A.M.*, xiv, pp. 80, 91] is stated to be common at Pusa and in the neighbourhood, causing a foot and root rot of the seedlings, in addition to the leaf symptoms. It lowers the percentage of germination and reduces the crop yield. Net blotch (*H. teres*) [ibid., xiv, pp. 80, 299] is common in the United Provinces and Nepal, but at Pusa is restricted to only a few introduced types, and has not been observed to attack the roots. Stripe disease (*H. gramineum*) [loc. cit.] is very rare at Pusa, possibly because the temperature does not fall sufficiently low to permit infection [ibid., v, p. 288], but it does occur in the United Provinces and Nepal, where the soil temperature is lower.

The damage caused by *H. sativum* to various types of Pusa barley varied from season to season and from plot to plot. The percentage leaf area affected by the fungus on 24 numbered types of barley during the years 1930–4 showed that none was immune, though some were resistant, infection varying from 0 to 11·0, 0 to 14·2, 0 to 6·75, and 1·1 to 22·6 per cent. in the four seasons, respectively, the corresponding figures for *H. teres* being 0 to 27·9, 0 to 25·4, 0 to 20·4, and 0 to 20·7 per cent. Observations showed that heavy dew and rain together with high temperatures are favourable to infection by *H. sativum*, the optimum temperature for the growth of the fungus being between 25° and 30° C., while the spores are capable of germinating between 8° and 35°. At the time when barley is sown at Pusa, the mean atmospheric and soil temperatures are near the optimum for the fungus, and hence considerable damage is caused in the seedling stage. With the lower temperatures prevailing during the winter months the activity of the fungus declines, but only to increase again in the spring when the temperature rises, the new activity causing secondary infection. Early varieties escape infection owing to the lower temperatures prevailing at the time they mature.

Details are given of various experiments made during 1930–4 on the control of spot blotch by seed disinfection. Good results were obtained with uspulun in the three seasons 1931–4, while ceresan in 1933–4 was even more effective; sulphur, mercuric chloride, and formalin were less satisfactory. Though the treatments controlled seedling infection to a greater or lesser extent, they failed to check secondary infection from air-borne spores from other host plants. This latter type of infection is, however, less important than the former, and it may be possible to breed new types of barley resistant to this phase of the disease. Crop rotation is recommended as a means of reducing the likelihood of infection occurring from the soil.

RADEMACHER (B.). **Bekämpfung der Heidemoorkrankheit.** [Control of the heath bog disease.]—*Mitt. Landw., Berl.*, l, 37, pp. 791–792, 3 figs., 1935.

Most of the information in this article on the control of the reclama-

tion disease of oats [see above, p. 72, and next abstract] and other crops in Germany has already been noticed from other sources [*R.A.M.*, xiv, p. 575], but the following supplementary items are of interest. The copper sulphate which has given such excellent results in the control of the disease during the past decade is generally applied at the rate of 50 to 150 kg. per hect. in the finely crystallized form known as 'snow', costing M. 22 to 25 per doppelzentner. Only minute traces of copper (30 to 50 gm. per hect., for instance, being detected in the straw of an entire crop of oats) are absorbed by the plants from the soil, with the result that the effects of a single application persist for a number of years. The reclamation disease may be largely combated by the provision of an ample water-supply, special care being taken to prevent undue loosening of the soil and the extensive formation of dry mould.

STEENBJERG (F.). **Undersøgelser over Manganinholdet i dansk Jord. III. Om Forholdet mellem Planternes Vœkst og Jordens ombyttelige Manganmaengde.** [Investigations on the manganese content of Danish soil. III. On the relation between plant growth and the amount of exchangeable manganese in the soil.]—*Tidsskr. Planteavl*, xl, 5, pp. 797–824, 1 graph, 1935. [English summary.]

Continuing his studies on the manganese content of Danish soils [*R.A.M.*, xiv, p. 393; xv, p. 8], the writer determined three values, namely, (1) the total amount of exchangeable manganese as expressed in milli equivalents per 27·5 kg. of air-dry soil (TMn), (2) the q-value, a measure of the difficulty experienced by the plants in absorbing the exchangeable manganese, and (3) a combination, by means of an equation, of these two values into a third (Mt), indicating the amount of available manganese in grams per hect. and growing period. During the period from 1932 to 1934, 279 soil samples from grey speck-diseased [see preceding abstract] and healthy crops (Borris oats, barley, rye, wheat, sugar and fodder beets, swedes, and potatoes) were collected and analysed on these lines. The resultant data showed that a TMn value below 0·5 involves a serious risk of grey speck, which in fact occurred in 95 per cent. of the samples from such soils; on the other hand, with a TMn value equal to or above 2·0, the disease is of little importance, having been found in only 5 per cent. of the material examined. The Mt limits above and below which grey speck did and did not appear, respectively, were found to be 60 and 300 to 400. On the basis of 30 field experiments on the effects of successive increasing doses of lime, an empirical equation was formulated to express the TMn value as a function of the hydrogen-ion concentration or the increase in the P_H of the soil.

MACKIE (W. W.), JOHANN (HELEN), & STEVENS (N. E.). **An unidentified species of Sphaeropsis on Maize in California.**—Abs. in *Phytopathology*, xxv, 9, p. 893, 1935.

In 1933 maize in two localities of California was affected by a disease involving premature ripening and stunting of the ears, which contained shrivelled kernels. Numerous lesions were borne on the first, second, or third internodes only, and much resembled the uredosori of stem [black] rust [*Puccinia graminis*]. During the maturation of the ears

the lesions erupt and the stalks become brittle, readily breaking under wind or other stresses. On a medium consisting of agar and maize stalk shavings mycelial growth was scanty, but pycnidia containing unicellular spores were formed, whereas on oat agar a heavy greyish-green stroma developed but no pycnidia appeared. The spores of the fungus, which is believed to be a species of *Sphaeropsis*, averaged about 15 μ in length, which agrees fairly well with *S. ambigua* recorded on maize. Further studies are necessary, however, for the final determination of the fungus.

Ruggieri (G.). **Alterazioni in 'Citrus sinensis' Osbeck determinate da 'Mycosphaerella aurantiorum' n.sp.** [Lesions on *Citrus sinensis* Osbeck caused by *Mycosphaerella aurantiorum* n.sp.]—*Boll. Staz. Pat. veg. Roma*, N.S., xv, 2, pp. 338–346, 8 figs., 1935.

Oranges growing at Fondi, Italy, showed one or more dark chestnut, round, depressed, hard lesions 3 mm. or more in diameter and covered in the chamois-coloured centre with minute dark spots. The epicarp and the outermost layers of the mesocarp under the lesions usually showed a dark discoloration sometimes reaching the endocarp. No internal rot was present. The discoloured tissues were disorganized and contained a thick weft of mycelium. The globose, chestnut-coloured pycnidia measured 82 to 123 μ in diameter, and contained hyaline, fusiform, uniseptate spores, 18 to 22 by 8·4 to 10·8 μ, borne on short, filamentous conidiophores. The fungus is referred to *Septoria* and is named [with a Latin diagnosis] *S. aurantiorum* n.sp.

Inoculations of wounded and unwounded oranges with pure cultures gave positive results only on the former. The fungus caused the characteristic discoloration, but did not produce subepidermal pycnidia.

In culture a perithecial stage developed, which the author names [with a Latin diagnosis] *Mycosphaerella aurantiorum* n.sp., characterized by subglobose, depressed, chestnut-brown perithecia 100 to 125 μ in diameter; the shortly stipitate, cylindrical asci measured 51 to 53 by 7 to 7·5 μ and contained 8 distichous, fusoid or curved, hyaline, mostly uniseptate, non-constricted ascospores, 9·6 to 12 by 2·9 to 3·6 μ; paraphyses were not seen.

Young leaves of orange nursery stock showed infection apparently due to the same fungus. They bore round spots 1 mm. or more in diameter, at first yellowish in the centre with a dark chestnut rim, but later becoming whitish. They were most conspicuous on the upper surface, and were surrounded by a pale green halo. Pycnidia corresponding to *S. aurantiorum* were formed on the affected spots. Inoculations of oranges with the organism isolated from the leaves produced symptoms typical of infection by *S. aurantiorum*, but in culture the reisolated fungus did not give rise to the perithecial stage.

Ruggieri (G.). **Alterazioni su frutti di 'Citrus sinensis' Osbeck causate da 'Phoma aurantiiperda' n.sp. e da 'Septoria citricola' n.sp.** [Lesions on fruits of *Citrus sinensis* Osbeck caused by *Phoma aurantiiperda* n.sp. and *Septoria citricola* n.sp.]—*Boll. Staz. Pat. veg. Roma*, N.S., xv, 2, pp. 313–322, 7 figs., 1935.

In 1935, oranges growing at Fondi, Italy, showed a round, hard, light

chestnut spot 1 cm. or more in diameter at the stylar end. Sections through the spots showed a dark discoloration of the epicarp and mesocarp, while the endocarp and the adjacent areas of the flesh were disorganized, blackened, or completely carbonized. In the deeper tissues dark olivaceous hyphae were present, and bore black, globose pycnidia 85 to 110 μ in diameter, containing hyaline, bacteriform spores, 2·4 to 3 by 1 to 1·6 μ, borne on short sporophores. The fungus is named [with a Latin diagnosis] *Phoma aurantiiperda* n.sp.

Inoculations of healthy wounded and unwounded oranges with pure cultures of the fungus gave positive results on wounded fruit only. Field and laboratory observations showed that the disease develops slowly inside the fruits, affected oranges seldom rotting either on the trees or on the ground, the outward symptoms of infection (the final stage) becoming manifest only after several days in storage.

Other oranges in the same groves showed one or more depressed, irregular, soft spots, chestnut-coloured at the centre and chamois at the periphery, and about 1 sq. cm. or more in area. The underlying tissues showed a rot closely resembling that due to *P. aurantiiperda*, the affected tissues containing a hyaline mycelium (olivaceous-brown in the deeper parts) with subglobose or ellipsoidal pycnidia, measuring 102 to 144 μ in diameter, and containing hyaline, filamentous, bacillary, non-septate spores 18·5 to 22·5 by 1·5 to 1·9 μ. The fungus is regarded as a new species of *Septoria* and is named [with a Latin diagnosis] *S. citricola* n.sp. Inoculations of wounded and unwounded oranges gave weakly positive results on the former only.

Ruggieri (G.). **Forme nuove di gommosi ed intumescenze delle foglie di Arancio.** [New forms of Orange leaf gummosis and intumescences.]—*Boll. Staz. Pat. veg. Roma*, N.S., xv, 2, pp. 347–354, 6 figs., 1935.

Young oranges in a nursery at Fondi developed a form of gum spot [*R.A.M.*, xii, p. 759] in which small, irregularly arranged punctiform lesions appeared on the under surface of the leaves, and coalesced into raised, chestnut-coloured to very dark brown pustules, 4 to 5 mm. wide. Small, yellow depressions and pock marks appeared on the upper leaf surface over the larger pustules.

Histological examination revealed a diffused hyperplasia of the spongy parenchyma and active tangential division of the cells. The intercellular spaces were filled with hyperplastic tissue, the affected part being double its normal thickness and frequently rupturing, exposing the necrosed elements within. This hyperplasia was always accompanied by gummification of the cell contents. The process began in a guard-cell of the lower epidermis, spread to the adjoining cells and the mesophyll, and frequently reached the palisade and upper epidermis.

Though the cause of the condition has not yet been ascertained it is considered to be due to some external factors which either kill the cells and set up gum formation or stimulate cell growth.

Fawcett (H. S.). **Prevention of brown rot gummosis on young Citrus trees.**—*Pacif. rur. Pr.*, cxxix, 19, p. 495, 1935.

To prevent brown rot gummosis (*Phytophthora citrophthora* and *P.*

parasitica) [*R.A.M.*, xiii, p. 301; xv, p. 14] under Californian conditions citrus trees on sweet orange or other susceptible stocks should be so planted that after settling, the first main lateral roots will be not more than 2 in. at most below the surface of the soil. Earth must also be prevented from coming into contact with the base of the tree. The bark from a distance of 6 or 8 in. above the base and down to the first main lateral roots should be protected by drawing back the soil and applying zinc sulphate-copper sulphate-hydrated lime dust (12–1–6) round the base of the trunk (2 oz. per tree). The application should be made just after planting and may be repeated after the second or third irrigation. Alternatively, the same mixture in water may be applied as a thin paste or spray. A third method is to pour the powder mixed with an equal amount of sand into a paper 'collar' fixed round the base of the trunk [ibid., xiii, p. 437]. If Bordeaux powder is used in the first two methods (it is too strong to be used in the collar) not more than $\frac{1}{2}$ oz. is required for each tree. Water must be kept from the trunk as soon as possible, and the soil cleared away exposing the top of the first main lateral roots. As the trees grow older more of the mixture may be used.

Rayner (M. C[heveley]). **Mycorrhizal habit in the genus Citrus.**—*Nature, Lond.*, cxxxvi, 3439, pp. 516–517, 1935.

Briefly drawing attention to the confirmation by Reed and Mlle Frémont of her observations in California on the relation of the mycorrhizal habit of growth in *Citrus* to an erratic response to the application of nitrogenous fertilizers [*R.A.M.*, xiv, p. 710], the writer again urges the necessity of expert diagnosis of root condition in respect to mycorrhizal equipment both as an index of soil environment and as a guide to efficient manurial treatments of crops having regular mycorrhizal associations.

Bitancourt (A. A.) & Jenkins (Anna E.). **Areolate spot of Citrus caused by Leptosphaeria bondari.**—*Phytopathology*, xxv, 9, pp. 884–886, 1 pl., 1935.

English and Latin diagnoses are given of *Leptosphaeria bondari* n.sp., the agent of areolate spot, a disease of citrus described by G. Bondar (*Bol. Lab. Path. veg. Bahia*, 7, 1929) as occurring in Bahia, Brazil, and recently observed in southern Brazil, Dutch Guiana, and Venezuela. The fungus, which produces zonate spots, up to nearly 4 cm. in diameter, pale at the centre, turning brown towards the periphery, often surrounded by a conspicuous yellow halo, on the leaves and twigs of oranges, lemons, and limes, is characterized by asci 60 to 70 μ long containing eight 3- to 5-septate, brown ascospores 21–24 μ long; spherical pycnidia (*Coniothyrium* stage), 60 to 161 μ in diameter, with spores 4 by 2 to 3 μ; similar pycnidia on the lesions, apparently belonging to the same organism, bore 4-septate spores 20 μ in length. At San Paulo monospore cultures were made from the ascospore and conidial stages of *L. bondari*, of which the former yielded a *Hendersonia* (possibly the septate conidial form mentioned by Bondar) while only *Coniothyrium* was derived from the latter. Inoculations with both cultures gave inconclusive results.

According to Bondar, the areolate spot is not new to Brazil, having

caused heavy damage in Bahia ten years before his report was published. He considered that the same disease had been ascribed in San Paulo to *Phyllosticta hesperidearum* [*R.A.M.*, xiii, p. 90] and in Ceylon to *P. disciformis* [ibid., vii, p. 427]. Bondar identified the *Leptosphaeria* stage of the disease as *L. citricola*, described from Italy without any mention, however, of the striking areolate lesions typical of the South American disorder. The latter is therefore attributed to a new species of *Leptosphaeria* as described above.

Bliss (D. E.). **The relation of Penicillium vermoeseni to a disease of ornamental Palms.**—Abs. in *Phytopathology*, xxv, 9, p. 896, 1935.

Penicillium vermoeseni Biourge (*P. roseum* group) [cf. *R.A.M.*, xi, p. 30; xiii, p. 181] has been isolated from *Phoenix canariensis*, *Washingtonia filifera*, and *Cocos plumosa* suffering, respectively, from leaf-base rot, bud rot, and trunk canker in southern California. Inoculation and re-isolation experiments with the cultures from these plants and one from date palm (*P. dactylifera*) proved their pathogenicity to their respective hosts, while cross-inoculations with cultures from *P. canariensis* on *W. filifera* and *C. plumosa* showed the various strains of the fungus to be similar in pathogenicity and of about equal virulence. In the case of *P. canariensis* death was found to be caused by the successive decay of the leaf bases from the oldest to the youngest; in that of *W. filifera* to the infection by the mycelium of the young, tightly folded leaves in the bud; and in that of *C. plumosa* to the weakening and breaking of the trunk.

Carneiro (J. G.). **A 'mancha do olho pardo' da folha do Cafeeiro.** [The 'grey eye spot' of the Coffee leaf.]—*Rev. Inst. Café Estac. S. Paulo*, x, 104, pp. 1893–1895, 3 figs., 1935.

A popular note, supplemented by a description of the causal organism, is given of the leaf spot of coffee caused by *Cercospora coffeicola* in San Paulo, Brazil [*R.A.M.*, x, p. 659], where the disease (of little practical importance) was first reported in 1901.

Hansford (C. G.). **Black arm disease in Uganda.**—*E. Afr. agric. J.*, i, 2, pp. 131–134, 1935.

This is a précis of the author's recent account of the cotton black-arm disease [*Bacterium malvacearum*: *R.A.M.*, xiv, p. 97] in Uganda.

Murata (M.). **Studies on the fish-net preservatives. I–III.**—*J. Soc. chem. Ind., Japan*, xxxviii, 8, pp. 425 B–430 B, 3 diags., 4 graphs, 1935.

Cotton and Manila hemp twines treated with various preservatives were affixed to iron frames and immersed in sea water for 280 days [cf. *R.A.M.*, vii, p. 514]. The tensile strength of each sample was measured ten times and the antiseptic action of the preservatives compared by calculating the mean of eight values, omitting the maximum and minimum. It was found that mixtures of coal tar with 5 per cent. by weight of copper sulphate, lead monoxide, malenite [ibid., xi, p. 14], and copper oleate were superior to coal tar alone. Treatment with a 20 per cent. copper oleate solution in Black Shell gasoline proved very effective in the earlier stages of the test, but considerable loss of weight followed and this method is therefore suitable only where very light

material is required. The coal-tar and copper compound treatment causes a temporary decrease, persisting for some four months, in the strength of the nets to about 85 per cent. of the original, succeeded by an increase to the former standard of tensile capacity.

GREGORY (P. H.). **The parasitic activity of the ringworm fungi.**—*Trans. St. John's Hosp. derm. Soc., Lond., 1935*, pp. 56–65, 1935.

In this paper the author points out that the invasion of the horny tissues of the skin by the ringworm fungi is made possible by the keratolytic properties of the group. A keratinase has not been isolated from any representative of the latter, but circumstantial evidence of its existence is found in the ability of the fungi (e.g., *Microsporon felineum*) [see next abstract] to make channels or rounded pits in the keratin of the hair or nail. But whatever enzyme is responsible, it is evidently non-specific in its activity, so that the restriction of certain fungi to a given host or parts thereof (e.g., the restriction of *M. audouini* and *M. felineum* to the hair of children though capable of eroding that of adults, and the limitation of attack by *Trichophyton interdigitale* to the glabrous skin though the fungus can infect hair) must be due to an inherent immunity of local origin, attributable in its turn to a delicate balance of local factors. Further elucidation of the problem of local immunity will necessitate studies on the physiology of the fungus in relation to its environment, and with a better understanding of the local factors at stake it may be possible to disturb their equilibrium to the disadvantage of the parasite concerned.

CATANEI (A.). **Huit nouvelles observations algériennes de microsporie.** [Eight new Algerian observations on microsporosis.]—*Arch. Inst. Pasteur Algér.*, xiii, 2, pp. 216–218, 1935.

Microsporosis is stated to be of extremely rare occurrence in the Mediterranean basin in general and in Algeria in particular [*R.A.M.*, xiii, p. 577], so that the recent detection in the latter country of eight fresh cases in children between 6 and 11 years old due to *Microsporon felineum* [*R.A.M.*, xv, p. 21] is of interest.

CATANEI (A.). **La résistance aux réinfections dans les teignes (étude expérimentale).** [Resistance to reinfection in ringworms (experimental study).]—*Arch. Inst. Pasteur Algér.*, xiii, 2, pp. 219–232, 1 pl., 1 graph, 1935.

Experiments were conducted with *Trichophyton asteroides* (*Ctenomyces* [*T.*] *mentagrophytes*) [*R.A.M.*, x, p. 243; xiv, p. 759] to determine the nature of resistance in guinea-pigs to reinfection by ringworm. It was shown that reinoculation with the fungus within 15 months of a previous infection gave positive results only in a small proportion of cases (5 out of 39). Resistance was associated with an allergic reaction of the von Pirquet type at the site of inoculation. Similar results can be obtained by the application to the skin or intradermal injection of culture filtrates or killed cultures of the pathogen. The allergic reaction is an index of the degree of resistance possessed by a given animal and as such is subject to individual variations.

Stühmer (A.). **Die praktische Bedeutung der Epidermophytien.** [The practical significance of the epidermophytoses.]—*Arch. Derm. Syph., Berl.*, clxxii (*KongrBer.*), pp. 120–125, 1 graph, 1935.

The alleged steady and very appreciable increase in the incidence of dermatomycoses associated with *Epidermophyton* and *Trichophyton* spp. in the Freiburg district of Germany, supported by similar observations by P. W. Schmidt in Westphalia [*R.A.M.*, xiii, p. 237], is discussed principally from the clinical standpoint [cf. next abstract]. During the period from 1st April to 1st September, 1934, the writer dealt with 138 such cases, representing 5 and 16 per cent. of all disorders among his panel and private patients, respectively. Infection is largely confined to young people (20 to 25 years) of athletic tastes in the upper ranks of society, and the hands appear to be the primary focus of attack. The importance of studies in the diagnosis of the fungi concerned is emphasized, and prophylactic measures are briefly indicated.

Hilgermann (Maria). **Schimmelpilzerkrankungen des Menschen und ihre Therapie.** [Human diseases caused by moulds and their cure.] —*Arch. Derm. Syph., Berl.*, clxxi, 6, pp. 593–609, 1935.

Clinical experience in Germany has convinced the writer that moulds such as *Penicillium*, *Mucor*, and *Aspergillus* spp. are greatly underrated as sources of human disorders [cf. *R.A.M.*, xv, p. 20], including chronic eczema, excellent and permanent control of which is stated to have been obtained by the use of autovaccines, a method applicable also to the various groups of dermatomycoses.

Oomen (H. A. P. C.). **Über Cephalosporium ballagii nov. spec.** [On *Cephalosporium ballagii* nov. spec.]—*Zbl. Bakt.*, Abt. 1 (*Orig.*), cxxxiv, 7–8, pp. 475–477, 2 figs., 1935.

The organism isolated from a case of nodular lymphangitis at Budapest [*R.A.M.*, xii, p. 289] and referred by Ballagi to *Acremonium* was submitted to the writer for further examination and found to be a hitherto unknown species of *Cephalosporium*, which is named *C. ballagi* n.sp. [with Latin and German diagnoses]. On beerwort, nutromalt, and Sabouraud's agars the colonies are smooth at first, becoming tortuously furcate, flesh- to salmon-coloured (orange to light brown on the under side), with a dense, floury, pale salmon efflorescence. The sterile hyphae are sparsely branched, septate, 1 to 2·5 μ in thickness; the simple or branched conidiophores, tapering towards the apex and sometimes showing a slight tendency to verticil formation, measure 15 to 35 by 1 to 2 μ (at the base) and bear globular, highly refringent heads, 7 to 26 μ in diameter, composed of hyaline, oval or ellipsoid conidia, 4 to 8·6 by 2 to 3·7 μ (mostly 6 by 2·7 μ).

Szathmáry (S.). **Infektion mit Achorion gypseum im Anschluss an eine Verletzung.** [Infection with *Achorion gypseum* following an injury.] —*Derm. Wschr.*, ci, 39, pp. 1217–1218, 1935.

Following some introductory observations on the development of the dermatophytes, the writer gives brief clinical details of infection by *Achorion gypseum* [*R.A.M.*, xiii, pp. 237, 768] as a sequel to an

injury to the arm of an 18-year-old girl in Hungary. In this connexion mention is further made of the isolation from the arm of a 16-year-old boy suffering from lupus vulgaris of an *Epidermophyton* alleged to be new to science and named [without a diagnosis] *E. gypseum flavum*.

Beresina (Mme P. F.). **Ein Fall von generalisiertem Favus mit Erkrankung der inneren Organe.** [A case of generalized favus involving the internal organs.]—*Arch. Derm. Syph., Berl.*, clxxi, 6, pp. 590–592, 1935.

Clinical details are given of a fatal case of generalized favus due to *Achorion schoenleini* [*R.A.M.*, xiv, p. 169] in an eight-year-old boy at Tashkent, U.S.S.R., the large, double-contoured spores of the fungus being isolated from scales from the head and body, nail parings, and the intestinal tract.

Redaelli (P.) & Ciferri (R.). **Pouvoir pathogène pour les animaux des algues coprophytes achloriques du genre Prototheca. Observations sur les Protothecaceae.** [Pathogenicity to animals of the achloric coprophytic algae of the genus *Prototheca*. Observations on the Protothecaceae.]—*Boll. Sez. ital. Soc. int. Microbiol.*, vii, 8–9, pp. 316–321, 1935.

Two algae isolated from the stools of patients suffering from sprue in Porto Rico were provisionally identified as yeasts near to *Schizosaccharomyces* [*R.A.M.*, xiii, p. 579], but upon comparison with *Prototheca zopfii* were found to be congeneric with this species and named *P. portoricensis* and *P. portoricensis* var. *trispora* [without Latin diagnoses; see next abstract]. The authors consider that *Eomyces crieanus* is also a *Prototheca*, probably close to *P. moriformis* and *P. portoricensis*, and accordingly transfer it to this genus as *P. crieana* n.comb.

The genus *Schizosphaeromyces* Alexieff is much nearer to the Protothecaceae than to *Schizosaccharomyces*. The three coprophytic species of *Schizosphaeromyces* described by the Russian author, *S. glutinosus*, *S. coprocola*, and *S. metachromaticus*, consist of spherical cells mostly provided with a thick, mucilaginous sheath; they are uni- or multiseptate and form tetrads or more numerous groups. Repeated cleavage of the cytoplasm causes the formation of small, uninuclear islands which become differentiated into uninuclear spores with a true membrane.

Subcutaneous and peritoneal inoculations of guinea-pigs with *P. portoricensis* and *P. portoricensis* var. *trispora* produced temporary lesions which the authors regard as definitely associated with a pathogenic action on the part of the algae.

Redaelli (P.) & Ciferri (R.). **Une nouvelle hypothèse sur la nature du Blastocystis hominis.** [A new hypothesis as to the nature of *Blastocystis hominis*.]—*Boll. Sez. ital. Soc. int. Microbiol.*, vii, 8–9, pp. 321–325, 1935.

In this paper the authors discuss the reasons which lead them to consider that *Blastocystis hominis* [*R.A.M.*, xii, p. 508] is an achlorophyllaceous alga very near the genus *Prototheca* [see preceding abstract], and that the genus *Blastocystis* can be included in the Protothecaceae

beside the three achlorophyllaceous genera at present contained in the order.

B. hominis produces 10 to 64 endospores, whereas the Saccharomycetes and the Endomycetes produce only a limited number of spores. The central body found in *Blastocystis* does not occur in the Saccharomycetes though nearly all the green algae possess a polymorphous chromatophore which in some genera resembles the central body of *Blastocystis*; it is a very variable cytoplasmic structure. The formation found in the Volvacineae and Palmellaceae is very closely analogous to that observed in *Blastocystis*. The yeasts seldom show any formation analogous to the mucilaginous capsule that surrounds the cysts in *Blastocystis*, whereas mucilage production is very common among algae. In the Saccharomycetes the protoplasm shows abundant, complex granulations, but in *Blastocystis* and the green algae these are comparatively rare.

In *Blastocystis* an initial stage of cleavage of the cytoplasm may cause a temporary segregation of plurinucleate masses, which through successive cleavages give rise to mononuclear elements; these become individualized, being surrounded with a membrane. The yeasts show nothing corresponding to this, but the same progressive cleavage of autospores is found in some algae and *Prototheca*. Furthermore, resistant stages (chlamydospores, hypnospores, &c.), are nearly always present in sporogenous and asporogenous yeasts but are never found in *Blastocystis*.

Blastocystis and the achlorophyllaceous Chlorophyceae *P. portoricensis* and *P. portoricensis* var. *trispora* have all been isolated from the human intestine; *Chlorella variegata*, a green member of the Chlorophyceae, can also live in the same habitat and give rise to achlorophyllaceous strains identifiable with species of *Prototheca*.

Finally, the authors' observations do not show that true multiplication by scission as seen in *Schizosaccharomyces* ever occurs in *Blastocystis*, in which reproduction takes place only by means of endospores. The endosporulated cysts or cystoids and the endospores or secondary cysts found in *Blastocystis* should be termed aplanospores and autospores, respectively.

Puntoni (V.). **'Proteomyces infestans Moses e Vianna, 1913' e suoi rapporti col genere 'Trichosporon Behrend, 1890'.** [*Proteomyces infestans* Moses & Vianna 1913 and its relations with the genus *Trichosporon* Behrend 1890.]—*R.C. Accad. Lincei*, xxii, 5–6, pp. 271–273, 1935.

The genus *Proteomyces*, founded by Moses and Vianna in 1913 (*Mem. Inst. Osw. Cruz*, v, p. 192), with the type species *P. infestans* [*R.A.M.*, xiii, p. 234], has been accepted by Ciferri and other mycologists, in whose views, however, the writer cannot altogether concur. He agrees with Ciferri on the following points: the absence of true endospores in *P. infestans*, the bodies so interpreted in the first instance being incipient arthrospores; the existence of two modes of reproduction —by arthrospores and blastospores; and the systematic position of the organism among the arthrosporous and blastosporous fungi represented, respectively, by *Geotrichoides* and *Mycotorula*. A comparison of *P.*

infestans with various characteristic species of *Trichosporon*, such as *T. beigeli* [ibid., xv, p. 20], *T. giganteum* [ibid., xii, p. 444], and *T. rugosum* revealed striking morphological and cultural parallels, including mycelial habit of growth, hyphal disintegration into arthrospores, blastospores, or small chains consisting of both elements mixed, chlamydospore and coremium production, the definitely cerebroid aspect of the whitish-yellow, later brownish colonies on Sabouraud's medium, pellicle formation on liquid substrata, and restricted proteolytic activity. In the writer's opinion *Proteomyces* and *Trichosporon* are identical, the latter name being recommended for retention on grounds of priority, so that *P. infestans* becomes *T. infestans* (Moses et Vianna) Puntoni. Verona and Nannizzi would also rank *Geotrichoides* [ibid., xiii, p. 767] as a synonym of *Trichosporon* [ibid., xiv, p. 170], but this proposal is disputed by the writer on the grounds both of the absence of true arthrospores and the creamy consistency of the colonies, which indicate that its place, at any rate for the present, is among the Torulopsidaceae-Mycotoruleae [cf. ibid., xiii, p. 635 *et passim*].

Benham (Rhoda W.). **The terminology of the Cryptococci with a note on Cryptococcus mollis.**—*Mycologia*, xxvii, 5, pp. 496–502, 2 figs., 1935.

The author gives a brief historical discussion of the usage followed by various authors in naming the fungal yeast-like forms which were placed in the genus *Torula* by Turpin in 1838 and in the genus *Cryptococcus* by Kützing in 1833, which has led to a regrettable confusion in the nomenclature, especially of the forms pathogenic to man and to animals. The terms *Torulopsis* and *Eutorulopsis* suggested by Ciferri in 1925 [*R.A.M.*, v, p. 229] have not been uniformly accepted, the majority of medical writers preferring the usage suggested by Castellani (*Arch. Derm. Syph., Chicago*, xvi, p. 383, 1927) of *Cryptococcus* for the pathogenic and *Torula* for the non-pathogenic forms. In a recent paper [*R.A.M.*, xiii, p. 162], however, he refers to *C. hominis* as *Torulopsis hominis* [*T. neoformans*: ibid., xv, p. 20], the latter generic name being also preferred by Lodder [Giordano, and Redaelli: ibid., xiv, pp. 193, 694, 758]. The objection that Kützing considered his *C. mollis* an alga is not tenable as an examination of his herbarium material showed definitely that it was not an alga but a yeast-like fungus, similar to the forms which have since been called *Cryptococcus*, *Torula*, *Eutorula*, and *Torulopsis*. Besides being commonly used in medical literature, *Cryptococcus* has priority over the other three genera, the last two of which have no wide currency. The name *Torula* was also given in 1801 by Persoon to a dematious fungus, not of this group.

It is suggested that Vuillemin's definition of the genus *Cryptococcus* should be emended somewhat as follows: unicellular fungi consisting of round or ovoid cells occasionally in chains but never forming a well-defined mycelium; reproduction by one or more buds, without ascospores; growth on artificial media in pasty or dry colonies, white or coloured. The other generic names should be discarded as synonymous with *Cryptococcus*. It is further proposed, since the identity of *C. mollis* is uncertain, to recognize *C. hominis* Vuillemin as the representative species of the genus, with the following brief description: cells

round to oval, 3 to 8 (usually 4 to 5 μ) in diameter; contents granular with lipoid globules, wall distinct and surrounded by a clear zone of capsular substance; giant colonies circular with a smooth glistening surface and mucoid consistency, white, tan, or deep brown.

FERRARIS (T.). **Parassiti vegetali della Canapa.** [Plant parasites of Hemp.]—*Riv. agric., Roma*, xxxi, 715, pp. 336–337, 1935.

Brief, practical notes are given designed to assist growers in the identification and control of the following hemp [*Cannabis sativa*] diseases occurring in Italy, viz., *Pseudoperonospora cannabina*, *Sclerotinia libertiana* [*S. sclerotiorum*: *R.A.M.*, vii, p. 299; xi, p. 652], *Dendrophoma marconii* [cf. ibid., xiii, p. 377], and *Septoria cannabis* [ibid., iv, p. 398; xiii, p. 215].

P. cannabina produces a yellow discoloration of the leaf, which becomes contorted and withered; ashen-grey conidiophores are present on the lower surface under the spots. The disease, which is often associated with infestation by the eelworm *Tylenchus devastatrix* [*Anguillulina dipsaci*], seldom occurs on a large scale; control consists in spraying with a 1 per cent. copper mixture and destroying diseased leaves found on the ground.

S. sclerotiorum produces a black discoloration at the base of the stems, which near soil level become covered with a white cottony mould gradually penetrating to the medulla. Affected stems are weak, fragile, and finally wither. Control consists in decreasing organic and increasing inorganic soil dressings, especially phosphates, thinning out the plants and removing and destroying the affected ones.

D. marconii, though seldom causing appreciable loss, is prevalent on hemp in some parts of Italy. Ashy, oval, sparse or isolated, occasionally confluent spots measuring 1 to 1·5 by 0·2 to 0·8 cm., elongated in the direction of the fibres, appear on the stalks, especially near the base of the stem. If infection is serious, the crop should be harvested early.

The commonest hemp disease in Italy is the leaf blight due to *S. cannabis*. In summer the leaves of affected plants, especially the lowest ones, show round, whitish, or ochraceous-yellow lesions with a dark border, and such leaves are liable to become curled and withered up towards the edges and to fall prematurely, leaving much of the lower part of the stem defoliated. If the upper leaves also become affected growth is seriously endangered and the yield may be much reduced. In districts where the disease is liable to occur the crop should be sprayed with a 1 per cent. copper mixture at the end of June or during the first half of July, and all withered leaves found on the ground should be burnt.

SMITH (K. M.). **Colour changes in Wallflowers and Stocks.**—*Gdnrs' Chron.*, xcviii, 2537, p. 112, 2 figs., 1935.

Wallflowers of the popular blood-red variety are stated to have recently developed an unsightly yellow flecking or 'break' in the colour of the flower, sometimes accompanied by leaf-mottling, which experiments at Cambridge showed to be due to the newly detected *Brassica* virus [*R.A.M.*, xiv, p. 669], the infective principle being conveyed to the flowers from the neighbouring cruciferous vegetables by *Myzus*

persicae. A similar but more serious disturbance, also caused by the *Brassica* virus, has been found to affect Brompton and Ten-weeks stocks [*Matthiola incana*, and its var. *annua*, respectively], the leaves of which become severely mottled and distorted while the flowers of pink varieties show a banding of white or darker pink. *Arabis* sp. and *Hesperis matronalis* are likewise subject to infection by the same virus, the leaves of the former showing profuse mottling and ring-like markings of darker green, while those of the latter develop dark green patches of the mosaic type, crinkling, and yellowing, accompanied by severe crippling of the plant. Control measures are briefly indicated.

McWhorter (F. P.). **Occurrence of Fusarium wilt of China Aster in Oregon.**—*Plant Dis. Reptr*, xix, 15, p. 246, 1935. [Mimeographed.]

During the past five years diseased asters [*Callistephus chinensis*] suspected of *Fusarium* wilt [*R.A.M.*, xv, p. 23] in Oregon have uniformly been found infected by a destructive virus, without any trace of the fungus being present. The latter, however, has recently been detected in a Corvallis garden, possibly as a sequel to the abnormally warm summer of 1935.

Ferraris (T.). **La 'cancrena pedale' del Geranio.** [Foot rot of Pelargoniums.]—*Riv. agric., Roma*, xxxi, 716, pp. 356–357, 1935.

Potted pelargoniums in Italy are commonly liable to a basal foot rot caused by *Sclerotinia libertiana* [*S. sclerotiorum*]. Plants infected during the vegetative season develop a yellow discoloration of the leaves; those at the base wilt, curl up, and fall, while those higher up remain attached to the plant longer, but do not increase in size. Few new shoots appear, and those that do form are chlorotic. The blossoms are few and small, and quickly fall. The base of the stem is blackened and growth occurs only in the green part, where the leaves and flowers at the ends of the shoots remain alive for a short time. The root system is disintegrated.

Prevention consists in the use of a suitable potting mould and careful watering. Slightly affected plants may be treated by washing the soil from the roots, cutting off the affected parts, dipping the plants for a few minutes in a 1 to 2 per cent. iron sulphate solution and carefully repotting in light soil. The writer obtained excellent control, even with severely diseased plants, by the application of the Caffaro ferfort fertilizer at the rate of 25 to 50 gm. per pot.

Flachs (K.). **Orchideenwelke.** [Orchid wilt.]—*Nachr. SchädlBekämpf., Leverkusen*, x, 3, pp. 129–137, 10 figs., 1935. [English and French summaries.]

Losses amounting to M. 10,000 are stated to have been caused in the orchid stands of the Munich Botanical Garden in 1934 by a wilt disease, generally spreading upwards from the stem base and consistently associated with the presence of a yellowish, flocculent mycelium composed of hyaline hyphae, 2 to 7·5 μ in diameter, with frequent clamp-connexions, and of dark-brown sclerotia, 1 mm. in diameter (2 to 3 mm. on boiled potato slices). The fungus grew on a variety of standard media (excluding meat broth), its development being most

profuse on carrot slices. The optimum temperature for growth was found to lie between 26° and 30° C. and the optimum humidity between 80 and 90 per cent.; at 6° to 18° and again above 30° development was scanty and it ceased entirely at 40°; neither the mycelium nor the sclerotia, however, were destroyed by exposure to temperatures several degrees below zero. The organism, which was identified as *Sclerotium rolfsii*, its taxonomic position and distribution being briefly discussed, was found to be capable of infecting a number of ornamentals besides orchids, e.g., *Polypodium*, *Platyceria*, and *Ficus* spp., *Victoria regia*, cineraria [*Senecio cruentus*], hydrangea, begonia, and azalea [*Rhododendron*]. Excellent control of the disease was obtained by the immersion of the underground portions of the plants for 15 minutes in a 0·5 per cent. solution of ceresan nassbeize and by repeated sprinkling of the plants and soil with the same preparation at 0·25 per cent.

Guterman (C. E. F.). **Diseases of Iris.**—Ex *Ext. Bull. Cornell agric. Exp. Sta.* 324, pp. 26–34, 3 figs., 1935.

Popular notes are given on the symptoms, etiology, and control of the following diseases affecting irises in the United States: leaf spot (*Didymellina macrospora*) with its conidial stage, *Heterosporium gracile* [*R.A.M.*, iv, p. 707; xiv, p. 698], bacterial soft rot (*Erwinia carotovora*) [*Bacillus carotovorus*: loc. cit.], crown rot (*Sclerotium delphinii*) [ibid., xv, p. 24], rhizome rot (*Botrytis convoluta*) [ibid., xii, p. 293], rust (*Puccinia iridis*) [ibid., xiv, p. 698], and mosaic [ibid., xiii, p. 380].

Guterman (C. E. F.). **Peony diseases.**—Ex *Ext. Bull. Cornell agric. Exp. Sta.* 321, pp. 32–43, 6 figs., 1935.

Popular notes are given on the symptoms, etiology, and control of the following diseases affecting peonies in the United States: the very prevalent and destructive blight caused by *Botrytis paeoniae* [*R.A.M.*, xiii, p. 460; xiv, p. 15], a somewhat similar but less common disease due to *Phytophthora paeoniae* [ibid., ix, p. 809; xiii, p. 445], stem rot (*Sclerotinia sclerotiorum*), wilt (two species of *Verticillium*) [*V. dahliae*: ibid., vii, p. 752 and (?) *V. albo-atrum*], miscellaneous foliar disorders associated with *Cladosporium* [*paeoniae*: ibid., viii, p. 293], *Septoria paeoniae* [ibid., xii, p. 205], *Cercospora* [*paeoniae*: ibid., v, p. 252], *Phyllosticta* [*paeoniae*: ibid., iii, p. 138], and *Alternaria* [ibid., iii, p. 139], mosaic [ibid., iii, p. 138; xiii, p. 151; cf. also xiv, p. 199], crown elongation [ibid., vii, p. 516], and Lemoine's disease [ibid., xiii, p. 445].

Green (D. E.). **A suspected virus disease of Paeonies new to Great Britain.**—*Gdnrs' Chron.*, xcviii, 2543, p. 213, 1 fig., 1935.

Peony leaves received for examination at the Royal Horticultural Society's Laboratory, Wisley, bore pale spots surrounded by well-marked concentric rings of light-coloured tissue, covering most of the surface. The material was forwarded to Dr. K. Smith, of the Virus Research Station, Cambridge, who considers the symptoms to be identical with those of peony ring spot in France [*R.A.M.*, xiv, p. 199], while a resemblance to the ring spot affecting the flower in the United States [ibid., ix, p. 629] is also indicated.

Harrison (A. L.). **The perfect stage of Phomopsis stewartii on Cosmos.** —*Mycologia*, xxvii, 5, pp. 521–526, 1 pl., 1935.

The stem blight of *Cosmos bipinnatus* caused by *Phomopsis stewartii* [*R.A.M.*, ii, p. 261] affected as many as 50 per cent. of the *Cosmos* plantings at the Geneva (New York) Experiment Station in 1934. The disease, which chiefly attacks plants at approximately the blooming stage or those weakened by other parasites, is characterized by dark brown, rapidly enlarging lesions, usually at the nodes of the main stem or branches, which are finally girdled. Material collected in the autumn of 1932, when placed the following spring in a moist chamber, produced after approximately five weeks a perithecial fungus which proved to be a new species of *Diaporthe* intermediate between *D. phaseolorum* and *D. arctii* [ibid., xiii, p. 270], and is named *D. stewartii*, with an English diagnosis. The perithecia are single, scattered, embedded under the pycnidial stromata, globose to lenticular, black, and 308 to 600 by 252 to 420 μ in diameter. The beaks are 1 to 1·5 mm. (rarely 2 mm.) long, tapering or filiform, and slightly hairy. The asci are sessile, elongate-clavate, 25·1 to 42·9 by 3·9 to 7·3 μ (average 31·7 to 37·6 by 4·6 to 5·9 μ) in diameter, with thickened apex, and evanescent paraphyses. The ascospores are distichous, ellipsoidal to fusoid, occasionally slightly curved, two-celled, and 9·2 to 17·2 by 1·3 to 3·3 μ (average 10·6 to 13·2 by 2 to 2·5 μ). The perithecia have not been observed in the field; in pure culture they were obtained only in one series on sterilized *Cosmos* stems.

The pathogenicity of both stages was demonstrated in the greenhouse, and the fungus was reisolated from the inoculated plants. Infection resulted from 90 per cent. of the inoculations made on plants in bloom or in a weakened condition, and from only 10 per cent. of those on young and vigorous plants. The incubation period and latent infection lasted from about two days to several weeks, depending on the age, size, and vigour of the plants.

Davis (W. H.). **Twig blight of the American Bladder Nut caused by Hypomyces ipomoeae.**—*Mycologia*, xxvii, 5, pp. 527–542, 3 figs., 1935.

This is a full account of the twig blight of the American bladder nut (*Staphylea trifolia*) caused by *Hypomyces ipomoeae* in the United States, a summary of which has already been noticed from another source [*R.A.M.*, xiii, p. 410].

Raabe (A.) & v. Sengbusch (R.). **Züchterisch wichtige Beobachtungen an einigen Lupinenarten. Die Empfindlichkeit von Lupinus luteus, Lupinus angustifolius, Lupinus albus und Lupinus mutabilis gegen Frost und Kalk und ihre Anfälligkeit gegen Meltau und Welke.** [Genetically important observations on some Lupin species. The susceptibility of *Lupinus luteus*, *Lupinus angustifolius*, *Lupinus albus*, and *Lupinus mutabilis* to frost and lime and their liability to mildew and wilting.]—*Züchter*, vii, 9, pp. 244–248, 5 figs., 1 graph, 1935.

In 1934 the German lupin crop suffered extensively from mildew [*Erysiphe polygoni*: *R.A.M.*, vi, p. 732], *Lupinus mutabilis* being the

only variety to show any degree of resistance, probably due to physiological factors.

Thielavia [*Thielaviopsis*] *basicola* [ibid., vi, p. 731; x, p. 293] and *Rhizoctonia* [*Corticium*] *solani* [ibid., iii, p. 722; viii, p. 235] were found on the roots of lupin plants affected by wilting. Inoculation experiments in the laboratory with the former pathogen, either by smearing the rootlets of seedlings with spores from a pure culture or by dipping them in a conidial suspension, gave positive results on *L. luteus*, *L. angustifolius*, *L. albus*, and *L. mutabilis*: under field conditions, however, the last-named is characterized by an exceptional capacity for resistance (only 0·8 per cent. infection compared with 96, 28·6, and 4·3 per cent. for *L. angustifolius*, *L. albus*, and *L. luteus*, respectively). Similar tests with *C. solani* sclerotia gave inconclusive results. Though *T. basicola* is a destructive parasite of lupin seedlings, the authors consider that it is only of secondary importance in the case of older plants, and the same is probably true of *C. solani*. The frequent absence in diseased material of any trace of a fungus, together with the occurrence of brown or brownish-purple stem discolorations, is suggestive of the stripe disease of Leguminosae, attributed in some quarters to *Bacillus lathyri* [ibid., xiv, p. 734] and in others to a virus [ibid., xiv, p. 108], the latter evidently being implicated in the causation of a similar disturbance of lupins in New Zealand [ibid., xv, p. 28; see also next abstract].

Köhler (E.). **Übertragungsversuche mit dem Virus der Lupinenbräune.** [Transmission experiments with the Lupin browning virus.]—*Angew. Bot.*, xvii, 5, pp. 277–286, 6 figs., 1935.

A tabulated account is given of the writer's experiments in the transmission of the lupin 'browning' virus (either crude or in dilutions up to 1 in 10,000), the agent of a disease in Germany apparently identical with 'sore shin' in New Zealand [see preceding abstract]. Most of the inoculations were made with Samuel's glass spatula [*R.A.M.*, xv, p. 41], but the needle-prick and rubbing methods were also used. The virus was transmitted from naturally infected *Lupinus angustifolius* and *L. luteus* to *L. angustifolius* and Samsun tobacco, and to all these hosts from artificially infected individuals. The outcome of inoculations on tobacco from *L. angustifolius* was more variable than from tobacco to tobacco, as was also in an even higher degree that of tests on lupin with the virus from tobacco, *L. luteus* being apparently less susceptible than *L. angustifolius*.

The lupin virus is readily influenced by external conditions, succumbing to ten minutes' heating between 50° and 60° C. but surviving two hours' standing in juice. Under laboratory conditions two types of the virus are distinguishable, namely, a relatively weak 'green' type, the attributes of which have persisted through many successive transfers to tobacco, and a virulent 'chlor' type, from which the 'green' is regularly isolated in dilution series, whereas 'green' apparently never reverts to 'chlor'. It is questionable whether these differences exist in the field.

After an incubation period of three weeks inoculated lupins showed chlorosis of the shoot tips and curtailment of the petioles of the apical leaves and topmost internodes. Black spots developed on the upper

and under sides, the pinnae tended strongly to roll and were liable to fall, and the leaves bent downwards. The upper third of the stem turned brown, the discoloration eventually spreading downwards, the lower leaves lost their pinnae, and the plants died prematurely.

Tobacco plants inoculated with crude or slightly diluted virus developed chlorosis and (under certain conditions of temperature and illumination) ring spot-like symptoms, accentuated in the case of marked variations of temperature into a so-called 'quercina' pattern. The upper leaves show a peculiar spotted mosaic not hitherto observed by the writer, while the lower ones subsequently develop a fine network of mottling. Diseased plants are distinctly stunted.

Data obtained as the paper was going to press indicate that the lupin virus is in all probability identical with the yellow mottle (virus 1) of cucumber [ibid., xiv, p. 811]. Transmission tests on the latter host gave positive results and the symptoms developing on the foliage agreed with those described and figured by Ainsworth in England.

TAKIMOTO (S.). **Phytophthorose of Buckwheat.**—*Bull. sci. Fak. terk. Kjusu Univ.*, vi, 2, pp. 105–110, 1 pl., 1935. [Japanese, with English summary.]

Phytophthora fagopyri n.sp. [a diagnosis of which is given in Japanese: *R.A.M.*, xv, p. 58] is stated to attack the roots of buckwheat and those parts of the stems that are near the soil surface, besides causing slight infection of ripe tomato fruits and bean seedlings. The affected parts contain oospores but no conidia. In culture conidia are produced on all media, and oospores on oatmeal agar.

DIEHL (W. W.). **Diplodina graminea Sacc. in South Carolina.**—*Plant Dis. Reptr*, xix, 15, p. 246, 1935. [Mimeographed.]

A little known fungus, provisionally referred to *Diplodina graminea* Sacc., which was originally reported from Italy and has not hitherto been observed in the United States, was detected on *Cynodon dactylon* in South Carolina in August, 1935. The pycnospores of the American material are slightly smaller than those described by Saccardo (11 to 13 by 4 to 5 as against 15 to 16 by 5 to 7 μ), but this difference is not regarded as specifically significant.

BRIEN (R. M.). **Three fungi causing 'brown-patch' of lawns in New Zealand.**—*N.Z. J. Agric.*, li, 3, pp. 157–159, 1 fig., 1935.

The author states that for a number of years bowling and golf greens and lawns in various parts of New Zealand have been affected with a condition locally known as 'brown patch' [cf. above, p. 74]; this is chiefly associated with three fungi, namely, *Sclerotinia trifoliorum* [*R.A.M.*, xiv, p. 315], which causes the development in turf of small, circular patches, 6 to 8 in. in diameter, at first yellow, later brown, and finally dying out, and which was isolated several times; *Corticium vagum* [*C. solani*: ibid., xiv, p. 240]; and *C. fuciforme* [ibid., xiv, p. 588]. On greens affected with any one of these fungi the condition was successfully controlled by applications of 3 oz. mercuric chloride in 50 galls. water, this quantity being sufficient to treat 2,000 sq. ft. of lawn.

Hildebrand (E. M.). **Silver leaf on fruit trees in New York.**—*Plant Dis. Reptr*, xix, 14, p. 236, 1935. [Mimeographed.]

On 5th June an unusual outbreak of silver leaf (*Stereum purpureum*) [*R.A.M.*, vi, p. 400; xiii, p. 493] was observed in Orleans County, New York, in an orchard of 440 Montmorency cherry trees, of which 65 were found to be definitely diseased and 25 showed doubtful symptoms when re-examined on 26th July. The majority of cases occurred on the north side of the orchard, indicating a possible correlation between infection and exposure. In five instances the symptoms were generalized, but as a rule they tended to be laterally or centrally localized.

Pratt (H. St. J.). **Fruit tree spraying in Queensland.**—*Fruit World, Melbourne*, xxxvi, 9, p. 9, 1935.

Under the Diseases in Plants Act it is compulsory to spray all deciduous fruit trees in the Stanthorpe Fruit District of Queensland during July or August (winter or dormant application) either with miscible oil, lime-sulphur [*R.A.M.*, xv, p. 37], or tar distillate. Schedules are given for appropriate fungicidal treatments against brown rot of stone fruits [*Sclerotinia fructicola*: ibid., xiv, pp. 559, 703], apple powdery mildew [*Podosphaera leucotricha*: ibid., xi, p. 519], pear black spot [scab: *Venturia pirina*], and certain other diseases.

Popova (Mme E. M.). Получение препарата пектиназы из **Botrytis cinerea** для осветления плодовых соков. [The preparation of pectinase from *Botrytis cinerea* for the clarification of fruit juices.]—*Микробиол.* [*Microbiol.*], iv, 2, pp. 247–253, 1935.

Botrytis cinerea was found to contain a pectinase [*R.A.M.*, xiii, p. 531] inducing active fermentation of apple pectin at P_H 3·4 to 3·6 and 25° to 30° C. The pectinase preparation dried at 40° can be kept for lengthy periods without deterioration; it decomposes 90 to 100 per cent. of the pectin in apple juice, complete transparency of which was thereby effected. In the case of cranberry pectin the pectinase produced by *Penicillium glaucum* showed greater fermentative activity than that of *B. cinerea*.

Esmarch (F.). **Weniger bekannte Blattfleckenkrankheiten der Birne.** [Lesser known leaf diseases of the Pear.]—*Kranke Pflanze*, xii, 9, pp. 129–132, 1 col. pl., 1935.

Popular notes are given on three comparatively unfamiliar leaf spots of pear and their control in Germany. *Mycosphaerella sentina* appears to be increasing in prevalence in Europe, judging by the severe epidemic of 1934 in Austria [*R.A.M.*, xiv, p. 771] and parts of Germany. Among the relatively few varieties resistant to this disease are Grumbkow Butter, Duchess of Angoulême, Liegels Winter Butter, Vereins-Dechants, Conference, and Bergamotte Renée. Leaf browning (*Stigmatea mespili*) [cf. ibid., iv, p. 355; xi, p. 799] causes premature defoliation of nursery stock; a high degree of resistance is shown by Clapp's Favourite, Dr. Lucius, Bonne Louise, Vereins-Dechants, Napoleon's and Liegels Butter, Duchess of Angoulême, and others. As alternate hosts of *Gymnosporangium sabinae* [ibid., xiii, pp. 316, 398,

543] are mentioned *Juniperus virginiana*, *J. oxycedrus*, *J. phoenicea*, *J. tripartita*, and *J. excelsa*.

HOETTE (SHIRLEY). **Certain aspects of investigations on black-end disease of Bananas in Australia.**—*Pamphl. Coun. sci. industr. Res. Aust.* 58, 22 pp., 3 figs., 1935.

In this detailed account of her investigations into banana black end [*R.A.M.*, xiv, p. 517] in Australia the author points out that the term has been used to denote stalk-end rots caused by different fungi. The condition appears only after ripening, the finger stalk becoming blackened and moist and the discoloration gradually spreading along the surface of the fruit for half an inch or more. It is only in very severe cases that the flesh rots, but the unsightly appearance of affected bananas reduces their market value considerably.

The chief causal organism is *Gloeosporium musarum*. It sets up a very moist form of the disease; the finger stalk readily breaks and is easily pulled off. The flesh usually becomes soft, but does not as a rule develop extensive rotting.

In a second type of black end several species of *Fusarium* are often associated with *G. musarum*, and may preponderate over the latter, though they are probably only secondary invaders. Occasionally, however, a buff-coloured species was found quite apart from the *Gloeosporium*, and evidence was obtained indicating that it can cause some development of disease.

A third type is produced by *Nigrospora musae* which causes a dry, black rot. If the fruit is kept very long the fungus penetrates the flesh which develops a soft rot. This phase ('end squirter') occurred several times in Brisbane in 1934. Infection is favoured by low temperatures, the optimum growth temperature of *N. musae* being 19° to 20° C.

In a fourth type, due to *Thielaviopsis* [*Ceratostomella*] *paradoxa*, the skin is black and very moist for a distance of nearly half the length of the fruit, which becomes covered with a white mycelium, rapidly turning greenish-black. The flesh is reduced to a semi-liquid consistency with an odour like that of an over-ripe pineapple. The rot spreads by contact, with the result that nearly all the fruit in a case may become infected.

Isolations from affected bananas seldom yield a fungus in pure culture, as so many organisms are present on the surface which gain a hold once rotting has begun. In 1934, however, several strains of *G. musarum* and *Glomerella cingulata* were obtained from black-end fruit. The strain of the former (A) most frequently isolated and proved to be the most highly pathogenic corresponds in spore size with Wardlaw's typical pathogenic form from bananas in the West Indies [ibid., xi, p. 382]. A second strain (B), isolated several times, though sometimes pathogenic, causes little damage as a rule; its spores measured 11 to 34 by 3·5 to 7·5 μ. A third strain (C), isolated only a few times, is practically non-pathogenic. Perithecia of *G. cingulata* were observed at times on affected fruit. The typical strain (A) agrees closely with Wardlaw's most common strain, the asci measuring approximately 70 by 12 μ and the ascospores 11 to 19 by 4 to 6 (average 16 by 5·5) μ.

Considerable variation was observed in subcultures of this strain and inoculations on bananas showed it to be practically non-pathogenic to them though able to infect ripe apples [ibid., xiv, p. 40]. A second strain (B) of *G. cingulata* was isolated from affected bananas on several occasions and a third (C) from perithecia on banana skins. Apart from other fungi five species of *Fusarium*, including the buff-coloured one mentioned above and one identified by Wollenweber as *F. oxysporum* (*F. cubense*) [*F. oxysporum cubense*], have been obtained from affected bananas but none appears to be strongly pathogenic to the fruit.

Inoculation experiments establishing the pathogenicity of the various organisms are described in detail. The chief difficulty found in making the tests was that numerous spores are already present on the fruit when picked. Mixed inoculations of bananas with *G. musarum* and one of the species of *Fusarium* proved to be no more pathogenic than *G. musarum* alone. No trace of any black-end organism was found in the air of the ripening rooms and it is clear that the spores are brought away on the bananas from the plantation, infection resulting under favourable conditions.

V[IÉ] (G.). **L'emploi des agents de mouillage dans les préparations antiparasitaires.** [The use of wetting agents in anti-parasitic preparations.]—*Industr. chim., Paris*, xxii, 260, p. 647, 1935.

Recent laboratory experiments are stated to have shown that the best wetting agents for incorporation in plant protectives [cf. *R.A.M.*, xiii, p. 389; xiv, p. 556] belong to a group of derivatives from turpentine essence, the terpenic alcohols, more especially terpineol. This product, which is manufactured on a commercial scale in the south-west of France (Landes), has been found to possess remarkable wetting properties due to the semi-polar grouping in its molecule. In order to stabilize terpineol in agricultural solutions it is essential to combine it with a sulphonated product, such as naphthol, sulphonate of soda, or one of the higher fatty alcohols. Terpineol will be found extremely useful in the vineyard and orchard, particularly for the dormant treatment of fruit trees, and it has also been successfully introduced into the textile industry.

HENIN (S.). **Quelques propriétés physico-chimiques concernant les liquides insecticides et anticryptogamiques.** [Some physico-chemical properties affecting insecticidal and fungicidal fluids.]—*Rev. Path. vég.*, xxii, 3, pp. 209–216, 2 figs., 1935.

The author gives explanations and describes in detail methods of measuring surface tension, wettability, viscosity, fluidity, and rigidity of liquids [cf. preceding abstract]. Wettability is taken to be the power of a drop to spread over a flat surface, and estimated by the angle made by the tangent to the edge of the drop with the horizontal. He conceives a drop of liquid to be constituted in a series of planes which slide one over the other when the drop moves. Liquids are viscous when these planes move slowly, fluid when they move rapidly, and rigid when they move only under strong differences of pressure. Rigidity is a static property never met with in pure liquids but common in solutions and suspensions.

The author points out that the attempt to find formulae representing the resultant of several of the properties may be fallacious. For example, the index of penetrability given by the ratio surface tension/viscosity, which is proportional to the rate of penetration of the liquid in a capillary tube, is inapplicable to rigid liquids. No formula expresses the effect of all five factors acting simultaneously. As regards the penetration of capillary tubes, the affinities between the groups of molecules of the liquid and those of the solid come into play but cannot be estimated, as they are insufficiently known. It is often impossible to explain or foretell the effect of a substance by measuring its physico-chemical properties, as conditions vary so widely and emulsions and spray mixtures (bouillies) are heterogeneous. In studying the properties of fluids account should be taken of properties more closely comparable with one another than those dealt with in the present paper; for example, instead of measuring wettability it might be more useful to determine the rate of spread of the drops of a spray fluid.

Mehrlich (F. P.) & Fitzpatrick (H. M.). **Dichotomophthora portulacae, a pathogene of Portulaca oleracea.**—*Mycologia*, xxvii, 5, pp. 543–550, 3 figs., 1935.

An account is given of an apparently undescribed hyphomycetous fungus which was found epidemic on purslane (*Portulaca oleracea*), a noxious perennial weed in the Hawaiian Islands. Histological examination showed that the brown fungus hyphae, about 6 μ in diameter, are distributed intracellularly throughout all the tissues of the host. In pure culture the fungus produces a copious mycelium, hyaline at first and largely aseptate, and resembling *Rhizoctonia* in branching habit. At least two distinct strains have been recognized, one producing conidia profusely but no sclerotia on malt agar, while the other produces abundant sclerotia but conidia following desiccation only. Both strains yield abundant conidia on their natural host.

A new genus, *Dichotomophthora*, of the Phragmosporae, is created for this organism which is named *D. portulacae*, with an English specific, but no formal generic, diagnosis. It does not form either pycnidia or stromata. The conidiophores are brown, regularly dichotomously to sub-dichotomously branched, successively elongating, 75 to 280 by 5 μ in diameter. The terminal branches are 4- to 8-lobed, bearing a single terminal conidium on each lobe. The conidia are smooth, exogenous, 1- to 6-celled, brown, ovoid to elongate-ovoid, rarely curved, 15 to 56 by 6 to 13 μ. The sclerotia are abundant, minute, black outside and hyaline to grey inside, irregular in shape, and 56 to 205 by 56 to 145 μ in diameter.

Glennie (Agnes E.). **Index to the literature of food investigation.**—Published by Dep. sci. industr. Res., Food Invest. Board, Lond., iv, 2, iv+182 pp., 1933; v, 1, 2, viii+283 pp., 1934; vi, 1, v+309 pp., 1935; vi, 2, v pp. and 311–621, 1935.

These are further numbers of the annotated bibliography of current English and foreign publications on food research which is issued twice yearly by the Low Temperature Research Station, Cambridge [*R.A.M.*, xi, p. 734]. The first part of Volume vi contains a 15-page review of

noteworthy developments in the subject during 1932–3, and the second part of the same volume deals with works published up to 1933, inclusive. The author was assisted in the preparation of Volume vi by Miss G. Davies.

SMITH (K. M.). **Plant viruses.**—ix+107 pp., 1 pl., 6 figs., 3 graphs, 1 diag., London, Methuen & Co., Ltd., 1935.

In this attractively presented booklet the author gives a clear and concise account of the more important characters and properties of plant viruses in the light of the most recent knowledge [cf. *R.A.M.*, xii, p. 776], with abundant references to the bibliography of 94 titles which is appended at the end. It is divided into ten chapters, namely, introductory, general technique of plant virus study, natural modes of transmission, the virus in the host, the virus outside the host, the virus in the insect vector, immunity, nature of the viruses and classification, control, and some comparisons between the plant and the animal viruses. In spite of its brevity, the book contains much information of interest and value to all those who desire to obtain a summary of the present position of knowledge of the subject.

SMITH (K. M.). **The problem of a plant virus infection.**—*Nature, Lond.*, cxxxvi, 3436, p. 395, 1935.

In further studies on the new virus disease [*R.A.M.*, xiv, p. 797] observed at Cambridge, inoculations showed that a high percentage of healthy, apparently normal White Burley tobacco plants carry the virus in the roots, while careful tests failed to demonstrate its presence in the stems and leaves of young plants, though it was isolated once or twice from the stems of old, apparently normal plants. Inoculations of White Burley tobacco plants with virus from their own roots gave severe localized symptoms. Symptoms developed naturally on tobacco seedlings in glasshouses from November until April.

A good deal of evidence was obtained that non-infectious young tobacco plants, grown in sterilized soil in an insect-proof glasshouse, may contain large quantities of the virus in the roots when tested five or six weeks later. Transmission on the seed, through the soil or in water, was shown by exhaustive tests to be unlikely, though seed transmission cannot be completely ruled out; the virus is not insect-borne. Natural infections were observed only on *Nicotiana tabacum* and, occasionally, on *N. glutinosa*, while the very susceptible cowpea, *Datura*, and tomato, though grown in glasshouses next to affected tobacco, did not once develop the disease. Three possible explanations of the problem are put forward. The virus may be present all the time in the stem, but in a non-virulent form which can become virulent only by concentrating itself in particular root cells, or in such a diluted form that a positive reaction is not obtained on inoculation. Secondly, the virus may arise spontaneously in the plant. Thirdly, an unknown mode of virus transmission may exist.

COOK (M. T.). **Host index of virus diseases of plants.**—*J. Agric. P.R.*, xix, 3, pp. 315–406, 1935.

This host index of plant virus diseases [cf. *R.A.M.*, xv, p. 40] repre-

sents an attempt to bring the first records of each disease together for the convenience of those interested in the subject. Up to the present time, virus diseases have been recorded on about 80 families, more than 400 genera, and nearly 1,000 species of plants. The authorities for the records are given in each case, and sometimes annotations are added. The host plants are arranged under the natural orders, both plants and orders being listed in alphabetical sequence.

Cook (M. T.). **Index of the vectors of virus diseases of plants.**—*J. Agric. P.R.*, xix, 3, pp. 407–420, 1935.

This index to the insect vectors of plant virus diseases is the counterpart of the previous bibliographical lists published by the author [see preceding abstract]. The insects are listed alphabetically and the authority for the record, the year of publication, and the host plants affected are cited. Originally it was intended to give first records only but some additional ones have been included.

Pollacci (G.) & Tredici (Vincenzina). **Sulla germinabilità asimbiotica dei semi di Orchidee.** [On the asymbiotic germinability of Orchid seeds.]—*Boll. Soc. ital. Biol. sper.*, x, 8, pp. 695–697, 1935.

Sterilized seeds of *Cymbidium giganteum*, *Cattleya gigas*, *C. walkeriana*, *C. memoriae cogghe*, *C.* hybrid, *C. albatros mossiae*, and *Phalenopsis schielleriana* var. Grand Condé were sown in the following substrata: filtrates of one-month-old *Rhizoctonia* [? *repens*] cultures on agar at P_H 4·8 killed in an autoclave, La Garde's medium with sugar (no fungus) at P_H 4·6, filtrates of old agar cultures of a fungus isolated from *Phalenopsis* killed by heating (P_H 5·3), Burgeff's medium without a fungus (P_H 5·3), and the same with the organism from *Serapias linguae* [cf. *R.A.M.*, xi, p. 317; xii, p. 634].

The best results were obtained with *C. giganteum* in the *Rhizoctonia* and *Phalenopsis* fungus media. In the cultures with the living fungus there was a tendency for the latter to overgrow the seeds and retard protocorm formation. No germination occurred on media containing neither a living fungus nor killed filtrates. The protocorms were transferred to tubes the soil of which was moistened from time to time either with sterile water or with a nutrient solution consisting of calcium and potassium nitrates, ammonium sulphate, potassium phosphate, and magnesium sulphate. The plants receiving the latter treatment showed a slight initial acceleration of growth, but this was not maintained, and subsequently there was no apparent difference in the development of the two series.

It would appear from these preliminary researches that the germination of orchid seeds depends less on the actual symbiotic relationship between them and the fungus than on the chemical products of the latter, an observation of considerable practical as well as purely biological importance.

Rice (Mabel A.). **The cytology of host-parasite relations.**—*Bot. Rev.*, i, 9, pp. 327–354, 1 pl., 1935.

From a review of the relevant literature [73 titles of which are cited in the appended bibliography] and her own cytological studies of the

host-parasite relations in certain rusts [*R.A.M.*, vi, p. 631; xiii, p. 532], the author shows the high degree of adaptation between host and parasite which has developed in the Uredinales, possibly through adjustment and linkage of the metabolism of the fungus with that of the host, the haustoria of six rusts, including *Uromyces caryophyllinus* and *Puccinia malvacearum*, being described and figured in illustration of the degree of adjustment attained. She shows further that parasitic specialization, which is highly expressed in the rusts, is a corollary to obligateness, and believes that their high degree of specialization has been effected by the elaborate development of the haustorium.

Ronsdorf (Liselotte). **Vergleichende Untersuchungen über die Wirkung verschiedener Wuchsstoffe auf das Wachstum einiger Pilze.** [Comparative investigations on the effect of various growth substances on the development of certain fungi.]—*Arch. Mikrobiol.*, vi, 4, pp. 309–325, 4 figs., 1 graph, 1935.

Pure auxin A (a cell-elongating phytohormone detected by Nielsen (*Jb. wiss. Bot.*, lxiii, p. 125, 1930) [*R.A.M.*, xv, p. 42] was found to exert no influence on fungal growth in nutrient solutions and could not be detected in the cultures by tests with *Avena* coleoptiles, which normally react to this substance by simultaneous curving and extension. Auxin is highly sensitive to oxidation and may have succumbed to this process.

Under the experimental conditions bios (which is obtainable from bakers' yeast and contains the phytohormone of cell division) [ibid., iii, p. 393], in appropriate concentrations, stimulated the development [as estimated by the dry weight of mycelium] of *Aspergillus niger*, *Sporodinia grandis*, *Allomyces javanicus*, *Ascochyta pisi* [ibid., xiv, p. 614], *Glomerella cingulata* [see above, p. 104], *Ophiobolus graminis*, *Cercosporella herpotrichoides* [ibid., xiv, p. 748], *Phytophthora citrophthora* [see above, p. 80], *P. erythroseptica* [ibid., xiii, pp. 180, 531], *P. terrestris* [*P. parasitica*: ibid., x, p. 755 *et passim*], and *P. cactorum* [ibid., xiv, p. 707; xv, p. 35]. No response to the bios treatment was manifested by *Helminthosporium sativum*, *Pythium irregulare* [ibid., xi, p. 330], and *P. de Baryanum*, while *P. mamillatum* [ibid., xiv, p. 240] and *P. intermedium* [ibid., x, pp. 696, 732] reacted by a retardation of growth. *P. acanthicum*, after a preliminary set-back, developed better with than without bios, which further slightly stimulated the growth of *P. splendens* [ibid., xi, p. 650]. It is considered remarkable that the closely related species of *Phytophthora* and *Pythium* used in these trials should respond so differently to the bios treatments. Attempts to separate the stimulatory from the inhibitory principle in the bios solution were unsuccessful.

The formation of Nielsen's growth substances A, identical with Kögl's heteroauxin, and B (*Jb. wiss. Bot.*, lxxiii, p. 125, 1930) was investigated in a number of fungi with very divergent results. *G. cingulata* produced an extraordinarily large quantity of A (35 γ per l. in six days, estimated according to the method of Went, *Rec. trav. bot. néerl.*, xxv, p. 1, 1928), the corresponding amounts for *P. mamillatum* and *P. intermedium* being 3·6 and 1·15 per l.; in 30 days *O. graminis* and *C. herpotrichoides* yielded, respectively, 0·6 and 1·2 γ per l., and in

14 days *Graphium* [*Ceratostomella*] *ulmi* formed 0·78 γ. Other organisms, including *P.* and *Phytophthora* spp., produced none of substance A during the period of the experiments. The sterilization of the nutrient solution inhibited the further development of substance A by *Glomerella cingulata*. Substance B, the production of which was estimated from the dry weight of mycelium grown in the sterilized old culture solutions, was formed in great abundance by *Rhizopus suinus* and in very much smaller quantities by *Cercosporella herpotrichoides*, *G. cingulata*, and *A. pisi*.

Olsen (C.). **Iron absorption and chlorosis in green plants.**—*C.R. Lab. Carlsberg*, xxi, 3, pp. 15–52, 1 col. pl., 14 figs., 1 graph, 1935.

In experiments at the Carlsberg laboratory, Copenhagen, plants requiring relatively large amounts of iron for their normal growth [cf. *R.A.M.*, xiv, p. 121], such as *Xanthium spinosum* and maize, were found to develop chlorosis in Knop's solution at P_H 6 to 7, this development being preventible by the addition of humus extract or ferric citrate. The leaves of chlorotic maize plants at P_H 7 frequently contain more iron than those of normal green ones at P_H 4·5 or 8, and are invariably better supplied with phosphate, calcium, magnesium, potassium, and nitrogen. This apparent anomaly is due to the fact that, with the onset of chlorosis, the production of organic matter ceases or greatly declines, while the absorption of salts from the nutrient solution continues. The inorganic substances are thus distributed over a smaller amount of dry matter in the chlorotic than in the normal plants.

Chlorosis in maize plants at P_H 6 to 7 results from the excessive absorption of phosphate, involving the precipitation of iron as phosphate in the vascular bundles, whence it is unable to pass into the mesophyll. An increase in the amount of phosphate in the nutrient solution causes an intensification of chlorosis at P_H 6 to 7 and further permits the disturbance to develop in the alkaline solutions, which now contain an excess of phosphate relative to calcium. Exactly the same effect is produced by decreasing the quantity of calcium, e.g., to one-fifth of the normal in Knop's solution.

Ferric tartrate was found to be somewhat less effective than ferric citrate or humus extract as a source of iron. On the other hand, chlorosis may be entirely prevented by the admixture with the nutrient solution of small quantities of ferrous salts, especially ferrous sulphate. Further observations indicate that in nature ferrous ions may act as a source of iron for plants, particularly in soils to which air cannot readily penetrate. For instance, the yellowing of beet foliage frequently encountered during the recent dry summers in Denmark has been found to be associated with iron deficiency, the amount of this mineral in the discoloured leaves being only 13 to 24 mg. per 100 gm. dry matter compared with a normal iron content of 38 to 63 mg. But this disturbance does not affect beets fertilized with Chile saltpetre [cf. ibid., xiv, p. 733], which exerts a binding action on the soil and thus furnishes the necessary conditions for the absorption of ferrous ions by the plants.

EATON (S. V.). **Influence of sulphur deficiency on the metabolism of the Soy bean.**—*Bot. Gaz.*, xcvii, 1, pp. 68–100, 3 figs., 1935.

This study on the effect of sulphur deficiency [cf. *R.A.M.*, xiii, p. 217; xiv, p. 610] on the growth of the soy-bean, was made on plants grown in quartz sand supplied with appropriate nutrient solutions. In the minus sulphur series the symptoms, which began to show up after four weeks and had become pronounced in six weeks, consisted chiefly in the yellow-green colour of the leaves, the smaller leaflets, and the thinner and harder stems, the yellowing affecting the upper leaves first. There was a tendency for the lower leaves to die and fall off, and the plants were less succulent than those of the plus sulphur series. Sulphur deficient plants had poor root development but the roots were not stunted as much as the tops. Similar effects of sulphur deficiency were observed on sunflower, kale, rape, and mustard, in contrast to tomato where the lower leaves become yellow first; in the case of mustard there was a definite reduction in the mustard oil content. The effects of sulphur deficiency on the chemical composition of the soy-bean are discussed in detail.

THOMPSON (A.). **Diseases of the Potato plant at Cameron Highlands.**—*Malay agric. J.*, xxiii, 9, pp. 410–420, 1 pl., 1935.

A brief popular account is given of three diseases of the potato, which have been observed in the Cameron Highlands in Malaya, where the cultivation of the crop is being attempted at altitudes above 3,000 ft., the plains being unsuitable for climatic reasons. The diseases dealt with are late blight (*Phytophthora infestans*) which was first recorded towards the end of 1934, and is stated to have already caused considerable damage; early blight (*Alternaria solani*); and bacterial wilt (*Bacterium solanacearum*) [see above, p. 80] which, if unchecked, may become very dangerous to potatoes in the Malayan highlands. Control measures against all three diseases are briefly discussed.

BERKNER (F.). **Der Einfluss zurückliegender Kalidüngungen auf das Trachtenbild (Abbauerscheinungen) sowie die Nährstoffaufnahme und die späteren Erträge der Kartoffelpflanze. III. Mitteilung.** [The influence of past applications of potash fertilizers on the performance (degeneration phenomena), assimilation of nutriment, and subsequent yields of the Potato plant. Note III.]—*Landw. Jb.*, lxxxi, 3, pp. 393–423, 1935.

A fully tabulated account is given of the writer's experimental observations at the Breslau Institute of Agriculture and Genetics on the connexion between past applications of potash fertilizers and potato degeneration (mosaic, leaf roll, and dwarfing) [*R.A.M.*, xii, p. 237], scab [*Actinomyces scabies*: ibid., xiii, pp. 50, 651], and 'Eisenfleckigkeit' [*R.A.M.*, xiii, p. 590; xiv, p. 717].

An appreciable increase in the incidence of all these diseases appeared to result from the potash treatments, the effects of which persisted for two years, potassium chloride being particularly liable to induce high percentages of scab [but see ibid., xv, p. 46] and 'Eisenfleckigkeit' in the Cellini variety. The amount of degeneration in the 1934 crops

treated the previous year with potash was estimated at 10 per cent. above that in the plots receiving none of this fertilizer, the corresponding increases for scab being 40 and 70 per cent. for potassium sulphate and potassium chloride, respectively. In the case of 'Eisenfleckigkeit' potassium sulphate augmented the trouble by 30 and potassium chloride by 70 per cent. The incidence of scab and 'Eisenfleckigkeit' in the Cellini plots receiving no potash was 25 and over 20 per cent., respectively.

A noticeable feature of the experiments was the virtual freedom from degeneration of the stands deriving from late (July) plantings in 1932.

Bell (R. H.). **Further notes on chemical sterilization as a means of eradicating Potato wart disease from the soil.**—*J. econ. Ent.*, xxviii, 3, pp. 519–524, 1935.

A tabulated account is given of experiments from 1932 to 1934, inclusive, in Pennsylvania, on soil disinfection against potato wart disease [*Synchytrium endobioticum*: *R.A.M.*, xiv, p. 788] by chemicals. Applications to artificially inoculated plots in 1932 of ammonium sulfocyanate at the rate of 1,200 and 2,000 lb. per acre gave entire control of the disease but resulted in a slow and incomplete germination and retarded growth of the potatoes (susceptible Rurals) which were planted two months after treatment of the soil; in 1933, however, the same plots without further treatment showed normal germination, growth, and yield of the potatoes, and continued freedom from wart disease, while the controls showed 90 per cent. infection. Spring applications of the cyanate in 1933 to artificially inoculated plots at rates from 800 to 3,200 lb. per acre also showed a similar depressing effect on the germination, development, and yield of the potatoes, proportionate to the dose applied, no wart developing in plots treated with 1,600 lb. or more per acre. An application at the rate of 2,000 lb. per acre to a naturally infected garden in April, 1933, retarded germination by 10 days but did not harm the development of Rural Russet potatoes planted 80 days later, while the most careful examination failed to reveal any indication of wart in the crop and the yield was well over 300 bush. per acre. Potatoes planted in this garden in 1934 without further treatment yielded 392 bush. per acre, without any trace of wart.

In the autumn of 1933 twelve naturally infected gardens were treated with the cyanate at the rate of 2,000 lb. per acre and a series of artificially inoculated plots were treated at rates from 1,600 to 3,200 lb.; all were planted to potatoes in the spring of 1934. The treatment gave entire control of the disease in ten of the twelve gardens, but 30 plants out of 4,000 in a garden that had remained under grass for 15 years were warted, and one plant was diseased in the twelfth, this small residue being presumably due to the physical condition of the soil. In every garden germination was markedly delayed, and in places where the concentration of the chemical was high, due to drainage, no plant growth developed. The plants, however, which did grow became very vigorous, owing in part to the fertilizing effect of the ammonium present in the chemical. In the other plots treated germination was retarded in all except the 1,600 lb. plots, but no wart disease developed in any.

The Potato crop, 1935.—*Mon. Rep. Minist. Agric. N. Ire.*, x, 5, pp. 12–13, 1935.

Of the area under potatoes in Northern Ireland in 1935, viz., 129,015 acres, 105,663 acres or 82 per cent. were sown to varieties immune from wart disease [*Synchytrium endobioticum*]; there has been a steady increase in the percentage of the total area planted to immune varieties every year since 1926. In 1935, the most popular varieties grown were again Arran Victory and Kerr's Pink, accounting for 39 and 26 per cent., respectively, of the total area.

Němec (A.). **Příspěvek k seznání chemické povahy půdy pozemků zamořených rakovinou Bramborů.** [Contribution to the knowledge of the chemical properties of soils infected with Potato wart disease.]—*Zem. Arch.*, xxvi, 3–4, pp. 129–132, 1935. [French summary.]

This is a Czecho-Slovakian version of a paper noticed from another source [*R.A.M.*, xiv, p. 650].

Park (M.) & Bertus (L. S.). **Sclerotial diseases of Rice in Ceylon. 3. A new Rhizoctonia disease.**—*Ceylon J. Sci.* (formerly *Ann. R. bot. Gdns Peradeniya*), xii, 1, pp. 1–10, 1 pl., 1934. [Received December, 1935.]

In continuation of this series of studies on the sclerotial diseases of rice in Ceylon [*R.A.M.*, xi, p. 599], the authors give an account of an outbreak which only occurred in 1926 on seedling rice at the experimental station, Peradeniya, when the plants were about 6 in. high. The diseased seedlings were pale in colour and 'thin' in appearance. The unfolded central leaves of the shoots of some of the plants were brown at the tips, and discoloured lesions were present on the leaves and stems. While none of the affected seedlings was killed, the attack resulted in a set-back to the plants. Hyphae of the *Rhizoctonia* type were found in and on the leaf and stem lesions, but the fungus was not observed to attack the roots. Isolations on maize meal agar produced a growth similar to that of *R.* [*Corticium*] *solani* [loc. cit.], but differing from it in the abundant production of small sclerotia (1 to 2, but occasionally up to 4 mm. in diameter) and in the persistent pale buff colour of the latter; in some strains a small proportion of the sclerotia become dark coloured, and resemble closely those of *C. solani*. The sclerotia, which have not been found in nature, commonly coalesce to form irregular sclerotial masses.

In inoculation experiments rice seedlings grown in tubes were invariably attacked by the fungus and a few were killed, but most commonly infection was restricted to the outermost leaf-sheath. Seedlings in pots were not infected to any extent, unless the soil was water-logged, when 25 per cent. of the plants kept under shaded conditions were killed, but only 15·2 and 8·2 per cent. of those kept in the open. Under flooded conditions infection and mortality were 100 per cent. in the shade, but only 12·9 of the plants died in the open, although most of the seedlings showed local infection in their outer leaf-sheaths. With older plants local infection occurred in the outer leaf-sheaths

of all the plants inoculated under flooded conditions, and a few of the plants were killed.

Sclerotia of the fungus survived 133 days in moist soil, 641 days in sealed tubes, and 571 days under tap-water, but could not withstand exposure to sunshine for 207 hours during 39 days.

While the differences between this fungus and *C. solani* are not sufficient to warrant their taxonomic separation, some distinction between them appears to be necessary, especially because of the marked difference in their pathogenicity. The authors accordingly distinguish the new fungus as strain A of *R. solani*.

PARK (M.) & BERTUS (L. S.). **Sclerotial diseases of Rice in Ceylon. 4. Sclerotium oryzae A strain.**—*Ceylon J. Sci.* (formerly *Ann. R. bot. Gdns Peradeniya*, xii, 1, pp. 11–23, 2 pl., 1 graph, 1934. [Received December, 1935.]

In this further instalment of this series [see preceding abstract] the authors describe a disease of rice, which was first reported in 1927 from the Southern Province of Ceylon, and which since then has been found on several occasions on rice and on stubble after harvesting. The disease was experimentally shown to be caused by a fungus which is considered to be a strain of *Sclerotium oryzae* [*Leptosphaeria salvinii*: *R.A.M.*, xv, p. 47], and is named *S. oryzae* A strain. The field symptoms caused by it are very similar to those produced by *S. oryzae* [ibid., xi, p. 599], the only difference of diagnostic value being that the new strain most commonly forms sclerotia inside the stems of affected rice plants, whereas *S. oryzae* produces abundant superficial sclerotia. The behaviour of both forms is also very similar in pure culture on various media, the chief difference being that *S. oryzae* on glucose agar forms a smoky white felt of mycelium, the colour of the medium being changed to pale crimson or crimson red, and sometimes to maroon brown, while the A strain forms a dark greyish-brown felt and changes the colour of the medium to a pale buff and then to a raw umber. Both fungi produce chains of pale olive-brown chlamydospore-like cells in this medium. Slight differences on other media are also briefly indicated. A further important difference between the two forms is that while the sclerotia of *S. oryzae* are sphaeroidal, smooth, black, and shiny, and 195 to 342 μ in diameter (175 to 580 μ in pure culture, mean $374 \pm 4{\cdot}3$ μ), those of A strain are irregular in shape, dull, not smooth, and 114 to 342 μ in diameter (76 to 410 μ in culture, mean $233{\cdot}25 \pm 3{\cdot}082$ μ).

Sclerotia of the A strain germinated after 133 days in moist paddy soil, 224 days in tap-water and 394 days in a corked specimen tube in the laboratory but were killed after 172 hours' exposure to the sun during 33 days.

Control by burning diseased plants *in situ* after harvesting is recommended.

PARK (M.) & BERTUS (L. S.). **Sclerotial diseases of Rice in Ceylon. 5. Rhizoctonia solani B strain.**—*Ceylon J. Sci.* (formerly *Ann. R. bot. Gdns Peradeniya*), xii, 1, pp. 25–36, 1 pl., 1 graph, 1934. [Received December, 1935.]

Continuing their studies in this series [see preceding abstracts], the

authors give an account of a disease of rice which was recorded only twice in Ceylon, namely, in 1927 from the Southern Province (in association with *Sclerotium oryzae* A strain) and again in 1931 from Kegalla. The diseased plants examined were found to be attacked occasionally at the first internode and more generally at the second and third internodes, suggesting that they had been infected at water-level much earlier; the diseased tissue was dirty brown, and some parts readily bent over at the point of attack. Sclerotia were relatively few in number, superficial, brown, purple-brown, or dark purple-brown, and roughly spherical macroscopically but of diverse shapes under the microscope; they were easily detached from the hyphae. The fungus was grown in pure culture on various media, and was found to differ from *Rhizoctonia*, [*Corticium*] *solani* and its A strain mainly in the shape, colour, and smaller size of the sclerotia, those collected from the base of rice stems measuring less than 1 mm., while in culture individual sclerotia attained 780 μ in diameter, the average being 472 μ; it is regarded as a new strain, B, of *R.* [*C.*] *solani*.

In inoculation experiments on rice seedlings, the fungus consistently failed to establish itself, even under the very favourable conditions of the tests in contrast to the other two strains. On older rice plants it is weakly parasitic, infecting the host at water- or ground-level, and not from the tips of the leaves. Flooded conditions do not appear to favour the parasitism of this strain and in none of the experiments did the fungus penetrate the roots of any of the plants tested. Viability tests showed that the sclerotia were still viable after 571 days immersion in tap water, and after 237 days in a corked tube in the laboratory. They also germinated after exposure for 284 hours to the sun during a period of 57 days.

BEELEY (F.). **Oidium heveae. Report on the 1935 outbreak of Hevea leaf mildew.**—*J. Rubb. Res. Inst. Malaya*, vi, 1, pp. 49–57, 1 graph, 1935.

The author gives notes on the occurrence of *Hevea* rubber mildew (*Oidium heveae*) [*R.A.M.*, xiv, p. 791] in Malaya during the first four months of 1935. Fine, dry weather in January and February induced 'wintering' (i.e., shedding of old leaves and the production of new ones), with the result that a large proportion of the trees had obtained a good, healthy crown of foliage before the weather favoured infection. Only in a few, isolated localities was mild leaf fall reported; in most cases it was favoured by climatic conditions caused by the proximity of mountains. In the Seremban, Siliau, and Rantau districts a considerable amount of sulphur dusting was carried out, but the effects of the disease were so slight owing to the prevailing weather that the foliage showed no visible improvement from the treatment, even after four weekly applications.

CHOLODNY (N. G.). Методы непосредственного наблюдения почвенной микрофлоры. [Methods for the direct observation of soil microflora.]—*Микробиол.* [*Microbiol.*], iv, 2, pp. 153–165, 1935. [English summary.]

The writer reviews the literature on the application to soil micro-

biological investigations of his 'overgrow plate' method [*R.A.M.*, xiv, p. 469], which has been found generally useful in spite of various defects, notably its unsuitability for the study of the dynamics of soil processes. The method is compared with the improved soil chamber technique [ibid., xiii, p. 471], the results obtained with which in a microbiological study of a forest soil near Kiev in the summer of 1935 are summarized. Not only were the common soil fungi readily determined by this method, but certain species of greater interest were detected which are liable to escape notice on the ordinary solid media, e.g., *Coëmansia reversa* Van Tiegh [cf. ibid., xii, p. 191] and *Helicomyces candidus* Cda. Experiments on cellulose decomposition [cf. ibid., xiv, p. 584] showed that in a soil chamber all the consecutive stages of this process can be observed and the part played therein by different micro-organisms determined.

Salgues (R.). **Les modifications biochimiques en phytopathologie.** [Biochemical modifications in phytopathology.]—*C.R. Soc. Biol., Paris*, cxix, 27, pp. 1396–1398, 1935.

Pharmaceutical analyses of the leaves of *Aconitum napellus* infected by the dirty grey to ashen, dark-bordered lesions of *Septoria lycoctoni* Speg. var. *macrospora* C. Mass. from the Lower Alps (France) showed in comparison with healthy ones no appreciable reduction of the alkaloid content. On the other hand, *Phyllosticta matthiolana* (Sacc. & Matt.) McAlp., the agent of oval or spherical, brown, often confluent spots on *Prunus laurocerasus* var. *schipkaensis* leaves was found to cause a considerable loss of total glucosides and hydrocyanic acid and a marked increase of soluble sugars with a corresponding diminution of insoluble polysaccharides, the composition of the adult diseased leaves examined in June being substantially identical with that of young healthy ones analysed in April.

Roldan (E. F.) & Tecson (J. P.). **The red rot of Sugar Cane caused by Colletotrichum falcatum Went.**—*Philipp. Agric.*, xxiv, 2, pp. 126–141, 2 figs., 1935.

Red rot of sugar-cane (*Colletotrichum falcatum*) [*R.A.M.*, xiv, p. 657] is stated to be of common occurrence but generally relatively unimportant in the Philippines, where it was first reported by Reinking in 1919. Germination and yield are not as a rule materially affected but comparative analyses of the sucrose contents of healthy and diseased canes showed a reduction in the latter of 31 per cent. The Pampanga Red, Luzon White, Wailuku No. 2, Mauritius 1900, and Zambales White varieties are susceptible to red rot, while P.O.J. 2878, Hawaii 109, and Linabing are more resistant. *C. falcatum* is a feeble parasite, pathogenic only to canes weakened and wounded by insects or mechanical agencies. The chief sources of inoculum are infected dried stalks, leaves, and clumps, while the spores are disseminated by wind, rain drops, insects, and irrigation water. Control measures should include seed selection, use of resistant varieties, elimination of sources of infection, and omission of ratooning in serious cases.

Liro (J. I.). **Mycotheca Fennica. Die Etiketten Nos 1–300.** [Mycotheca Fennica. Labels Nos. 1–300.]—98 pp., 1 map, Inst. Phytopath. Univ. Helsinkiensis, Helsingfors, 1934. [Received December, 1935.]

This booklet consists of copies of the labels of the first 300 exsiccata of the above series, all of which were issued in December, 1934. The species are all pathogens, and are accordingly mainly rusts, smuts, powdery and downy mildews, Exoascales, or members of the Fungi Imperfecti. Included in the collection are four new species of *Cintractia* on species of *Carex*, and one each of the genera *Doassansia* and *Entyloma*; these are provided with diagnoses in German. *Doassansia limosellae* is transferred to *Burrillia* as *B. limosellae* (Kunze) Liro. The author accepts the generic name *Tuburcinia* (13 species) in lieu of *Urocystis*, and *Albugo* in lieu of *Cystopus*. Under each name, in addition to the locality, collector, and date, the necessary systematic literature is cited. The Finnish literature is also quoted or alternatively the species (or host) is starred as a new record for Finland. Finally a map of the country is marked off with the accepted phytogeographical provinces.

Zeller (S. M.). **Some miscellaneous fungi of the Pacific Northwest.**—*Mycologia*, xxvii, 5, pp. 449–466, 3 figs., 1935.

This is an annotated list of 45 miscellaneous fungi which were collected in the Pacific Northwest of the United States, including one genus and four species which are described as new. The following may be mentioned. *Nectria ditissima* var. *major* Wr., apparently unrecorded hitherto in North America, was found on *Alnus oregona*. *Atropellis pinicola* [*R.A.M.*, xiii, p. 685] was collected on *Pinus strobus* and on *P. lambertiana* in the Calaveras County of California, this extending the southern known limit of its range. The pycnidial fungus usually associated with it, which was previously referred to *Fuckelia pinicola* [ibid., ix, p. 815], is now transferred to a new genus, *Neofuckelia*, which is created for it [with Latin and English diagnoses]; the new genus differs from *Fuckelia* chiefly in that its pycnidia are ostiolate and in one stratum, while in the latter they are closed and merely locules without particular arrangement in the globose stroma. *Cenangium piniphilum* Weir was found on *P. albicaulis*, a new host. *Rhizina inflata* [*R. undulata*: ibid., xiv, p. 633] was observed attacking the roots of *P. contorta* and smothering two- to three-year-old seedlings; this is the first record of the fungus west of Idaho. *Fomes annosus* was collected from felled logs of *Acer macrophyllum*, an interesting instance of this fungus on a hard wood. *Glutinium macrosporum* [ibid., vi, p. 735], which occurs on apple bark, was examined by Miss Wakefield who found it to be synonymous with *Sphaeronema pruinosum* Peck; this is now confirmed by the author, who, however, does not believe the fungus to be a good species of *Sphaeronema*, but leaves the question of its classification open. *Diplodia sycina* var. *syconophila* [ibid., iv, p. 610] was found for the first time on *Ficus carica* in Oregon. *Ramularia destructans* occasionally caused a foot rot of *Panax quinquefolium* in Columbia.

Shear (C. L.) & Stevens (N. E.). **Sphaeria zeae (Diplodia zeae) and confused species.**—*Mycologia*, xxvii, 5, pp. 467–477, 2 figs., 1935.

The authors produce evidence showing that the fungus now generally known as *Gibberella saubinetii* [*R.A.M.*, xiv, p. 749] was described by L. v. Schweinitz as *Sphaeria zeae* in 1822, and that the well-known *Diplodia zeae* (Schw.) Lév. was called by v. Schweinitz in the same year *S. striaeformis γ*. They consider that, according to the present International Rules of Nomenclature, *G. saubinetii* and *D. zeae* should have new specific names, but this course is deprecated, as the present names have been established by usage for over 50 years. Fungi synonymous with *D. zeae* are: *Sphaeria striaeformis* var. *γ*, Schw. 1822, *S. zeae* Schw. 1832, *S. maydis* Berk. 1847, *S.* (*Hendersonia*) *zeae* (Schw.) Curr. 1859, *H. zeae* (Curr.) Hazsl. 1873, *D. maydis* (Berk.) Sacc. 1884, *Diplodia zeae* (Schw.) Lév. 1848, *Dothiora zeae* (Schw.) Bennett 1888, *Macrodiplodia zeae* (Schw.) Pet. & Syd. 1923, and *Phaeostagonosporopsis zeae* (Schw.) Woronich. 1925 [ibid., x, p. 295].

Storey (H. H.). **Virus diseases of East African plants: II—Leaf-curl disease of Tobacco.**—*E. Afr. agric. J.*, i, 2, pp. 148–153, 6 figs., 1935.

Tobacco leaf curl [*R.A.M.*, xiv, p. 533] appears to occur throughout Africa, wherever tobacco is grown, and in many parts of East Africa it is probably the most serious disease of the crop. After giving a brief account of the symptoms, the author states that the leaf curl virus has not yet been transmitted by mechanical inoculation with infected sap, but is readily transmissible by grafting. Transmission experiments with the insect vector (*Bemisia* sp.) have been successful only when healthy tobacco seedlings were colonized with large numbers of adult white flies transferred from a diseased plant. Enations, similar to those produced by the disease in tobacco, were found on *Vernonia* and *Sida* spp. in Tanganyika, Nyasaland, and Southern Rhodesia. In one experiment at Amani leaf curl was successfully transferred by white flies from *V. iodocalyx* to tobacco, but the reciprocal experiment, from tobacco to *Vernonia*, only produced vein-clearing. The virus was transmitted [from tobacco] to tomato plants, which became stunted and curled, but failed to develop the characteristic enations. Cotton leaf curl is unknown in East Africa and further, cotton varieties susceptible to leaf curl [ibid., xiv, p. 757] did not contract the disease when grown together with leaf-curl tobacco; it appears, therefore, that in East Africa the disease is not intertransmissible between tobacco and cotton. Attempts to breed varieties of tobacco immune from leaf curl gave negative results, sixteen imported varieties and also hybrids with other species of *Nicotiana* proving susceptible.

McKinney (H. H.). **The antigenic properties of plant viruses.**—*Science*, N.S., lxxxii, 2125, pp. 276–277, 1935.

While agreeing in general with Chester's conclusions as to the antigenicity of plant viruses [*R.A.M.*, xiv, p. 782], the writer takes exception to certain steps in the experimental procedure and interpretation of the results. For instance, a study of the graphs showing the effect of temperature on four different tobacco viruses indicates that, though

each of the vertical scales appears to be plotted on a logarithmic basis, the infectivity scale is not truly logarithmic throughout, since the upper end is abnormally compressed in relation to the lower portion. The precipitin dilution scale, on the other hand, is uniformly logarithmic throughout. The determination of the infectivity data from the graphs was very difficult in the absence of a numerical method of presentation, but close estimates were obtained and replotted, together with the serological reaction figures, on semi-logarithmic paper. It was found that, in the cases of tobacco mosaic and ring spot, the datum points for infectivity and serological reaction of the unheated viruses do not coincide, the discrepancy being particularly marked in the former virus. The curve proximity emphasized by Chester is accentuated by the use of the logarithmic scale which compresses parallel with the increasing magnitude of the data. There appears, however, to be a close coincidence between the highly significant infectivity and serological reaction end points of the heated and chemically treated viruses used in the tests.

Koenig (P.) & Rave (L.). **Beiträge zur Tabak-Systematik und -Genetik. I. Sortenmerkmale am deutschen Tabak.** [Contributions to the taxonomy and genetics of Tobacco. I. Varietal characters of German Tobacco.]—*Landw. Jb.*, lxxxi, 3, pp. 425–503, 9 pl., 7 figs., 1935.

A few items of phytopathological interest occur in this comprehensive survey of the varietal characters of German tobaccos, preceded by an historical introduction to the taxonomy and genetics of *Nicotiana*. At the Forchheim (Baden) Research Institute, resistance to wildfire [*Bacterium tabacum*: *R.A.M.*, xv, p. 61] has been manifested not only by the wavy-leaved Amersfoort 1/5 itself but also by its hybrid progeny. On the other hand, a leaf curl of the 'mauke' type [ibid., vii, p. 548] occurring in a severe form in 1932 appears to prefer the Amersfoort and U types and their offspring.

Armstrong (G. M.) & Sumner (C. B.). **Investigations on downy mildew of Tobacco.**—*Bull. S.C. agric. Exp. Sta.* 303, 23 pp., 1 fig. 1 graph, 1935.

Tobacco downy mildew (*Peronospora tabacina*) [*R.A.M.*, xiv, p. 723 and next abstracts] appeared in South Carolina, probably for the first time, in the spring of 1931, when it was also present in Georgia and North Carolina. A year later it returned, reducing the yield by approximately 40 per cent., since when it has recurred every year and though not causing any great damage constitutes a permanent threat to the local tobacco industry.

In 1932, severe losses from the fungus also occurred locally on pepper [*Capsicum annuum*: ibid., xiv, p. 723], but only insignificant infections have been noted on this host since.

When numerous tomato, eggplant, and pepper plants were inoculated with the conidia of *P. tabacina* from tobacco and kept in special temperature-humidity chambers, lesions developed in a few days, but conidia were produced only on one tomato leaf, though tobacco plants similarly treated developed the disease abundantly. Tomato and egg-

plant seedlings, inoculated, and placed in the shade at the edge of an infected tobacco bed bore conidia after five days, pepper seedlings used in the same test producing conidia on the seventh day. Inoculations with conidia from pepper gave positive results on tobacco.

The conidia germinated at temperatures from 1° to 3° up to 29° C., with the optimum between 15° and 23°, and on dry slides at relative humidities of 98·2 per cent. and over. At 16° to 20° fresh conidia showed very high percentage germination in 24 hours, though on several occasions germination was markedly delayed. All attempts to germinate the oospores failed. A relative humidity below dew-point (i.e., between 78 and 89 per cent) and a temperature of 16°±1° permitted the production of conidia and enabled infection to take place from inoculations made under these conditions.

Inoculated tobacco plants kept for 12 days at 31·5° to 32° showed no symptoms of the disease; infection occurred at 30°, but no conidia were produced. Abundant infection with conidial production occurred on two very small, succulent plants kept at 25° to 26°, some fruiting being noted on four leaves of larger plants. No infection took place below 5° to 8° C.

Field observations supported the view generally held by growers that recovered plants cease to be susceptible, but in experiments repeated infection of such plants was obtained. Young hardened plants were less susceptible than older, succulent ones. Sporadic sporulation seen in beds during two winters probably resulted from the persistence of the fungus within the host [cf. ibid., ix, p. 3].

Satisfactory control resulted from maintaining a constant minimum temperature of 31° in the beds [ibid., xiii, p. 402], but the method is too expensive for the average grower. Spraying with cal-mo-sul [loc. cit.] (1 and 2 oz. per gall.) gave encouraging results, two representative sprayed beds averaging (after recovery) 1,465 plants each, as compared with 423 in the controls, while six beds sprayed six times with cal-mo-sul and colloidal sulphur averaged, respectively, 450 and 554, as compared with 349 in the unsprayed controls. In a more extensive test, beds were sprayed eight times at 4-day intervals with cal-mo-sul (2 oz. per gall.), colloidal copper, and red copper oxide [ibid., xiv, pp. 218, 563] (½ oz. per gall. with a spreader), unsprayed control beds being interspersed with the treated ones. The cal-mo-sul treatment gave 19 healthy plants, 263 plants with less than a quarter of the leaf area affected, 206 with less than half, and 12 with the entire leaf area affected, the corresponding figures for colloidal copper being 7, 284, 203, and 6; for red copper oxide 4, 237, 249, and 10; and for the controls 0, 139, 335, and 26.

The paper terminates with brief general suggestions for control by improved cultural practices.

Angell (H. R.), Hill (A. V.), & Allan (J. M.). **Downy mildew (blue mould) of Tobacco: its control by benzol and toluol vapours in covered seed-beds.**—*J. Coun. sci. industr. Res. Aust.*, viii, 3, pp. 203–213, 1935.

In experiments carried out in Australia on the control of tobacco downy mildew (*Peronospora tabacina*) [see preceding and next abstracts]

by hydrocarbon vapours healthy seedlings in pots were placed in six cold frames with a pot of diseased seedlings in the centre of each. Four dishes with a total evaporating surface of 50 sq. in. were placed in each of four frames and filled twice daily until 20th February with benzol, toluol, xylol, and naphtha, respectively. Equal amounts of a heavy suspension of the conidia of *P. tabacina* were sprayed on all the seedlings on 8th February, and three days later every seedling in the control frame was diseased. On 12th February, scattered infections were noted in the xylol- and naphtha-treated frames, but all the plants in the benzol- and toluol-treated frames were still healthy when the experiment was concluded on 27th February.

To determine the effect of removing the covers and liquids on five days (four beds being kept closed for purposes of comparison), two seed-beds 66 by 6 ft. were sown on 1st March. Exposure to benzol, toluol, and motor spirit was begun on 13th March in ten cold frames, four others serving as controls. On three occasions between 12th and 26th April conidia of *P. tabacina* were shaken over each frame. When the experiment was concluded on 31st May, most of the controls had been killed by the disease; infection was present in both the beds in which ordinary petrol was used, but all the seedlings treated with benzol and toluol had remained healthy, irrespective of the cover used (glass, windolite, or oiled calico), in the frames opened on five days and in those kept closed, and with evaporating surfaces maintained at 50 sq. in. or gradually reduced from that area to 25 sq. in.

Further tests were made with benzol and toluol in 40 beds of the Bathurst type, the surface area of liquid exposed being approximately 1/144, 1/72, and 1/36 of the areas of the beds. The seedlings were inoculated on 3rd, 5th, and 11th May, and by 6th June all the controls were dead or dying. In every instance the smallest evaporation surface allowed isolated areas of very slight infection to develop, but the spread to other plants was extremely slow. When the evaporation surface area was not less than 1/72 that of the seed-bed, benzol completely prevented infection and toluol very nearly so.

Further experiments under the conditions that prevail locally in spring must be made before the methods described can be recommended for commercial use.

Tobacco diseases. Smoking tests.—*Qd agric. J.*, xliv, 1, pp. 37–39, 1935.

In tests carried out by the Commonwealth Bureau of Scientific and Industrial Research in Victoria and New South Wales spraying with copper emulsion, colloidal copper, and Bordeaux mixture did not prevent infection of tobacco by blue mould [*Peronospora tabacina*: see preceding abstracts] but tended to check the spread of the disease. Extremely satisfactory results were obtained, however, in experiments with benzol and toluol. Experimental evidence showed that the sprays recommended by the Queensland Department of Agriculture against *P. tabacina* [ibid., xiii, p. 332] were also effective against leaf spot [*Cercospora nicotianae*: ibid., xiv, p. 200].

No commercial varieties of tobacco are immune from *P. tabacina*, but some are less susceptible than others. It is suggested that the native home of tobacco, South and Central America, should be searched for

resistant types which could be used in hybridizing with commercial lines to develop resistant strains. The wild host *Nicotiana glauca* was found heavily infected in Victoria.

SMITH (K. M.). **Two strains of streak: a virus affecting the Tomato plant.**—*Parasitology*, xxvii, 3, pp. 450–460, 2 pl., 1935.

The author gives a brief description of the symptoms produced on tobacco (White Burley), *Nicotiana glutinosa*, *N. langsdorffii*, tomato, *Datura stramonium*, *Hyoscyamus niger*, *Petunia* sp., and potato (Arran Victory) by inoculation with a virus which was obtained in 1931 from a tomato plant exhibiting the typical symptoms caused by tomato streak virus No. 1 [*R.A.M.*, xiv, p. 261]. He considers that this virus is probably a green strain of the latter virus, intermediate in character between this virus and tobacco mosaic virus No. 1 [ibid., xiv, pp. 661, 722], inasmuch as it resembles tomato streak No. 1 in the leaf mottling and occasional stem necrosis it induces in tobacco, and resembles tobacco mosaic virus No. 1 in the mottling produced in tomato, usually without stem necrosis, while differing from it in the comparative absence of leaf distortion in tobacco; it differs from both in its usually fatal effect on young *N. glutinosa* plants. The new strain was maintained for four years by transfers in White Burley tobacco, and in 1934 it was noticed that one of the inoculated plants had developed a small yellow spot. Inoculations were made from this spot into young tobacco plants, and after about six such transfers, in which the yellow tissue alone was used for inoculation, a virus was isolated which produced a bright yellow mottling on leaves of White Burley tobacco.

It was not found possible to isolate the yellow strain of the virus absolutely free of the green. However highly concentrated the yellow strain appeared to be in the inoculum, the inoculated leaves always showed finally a great preponderance of green virus with here and there a few yellow spots, the only apparent effect of increasing the concentration of yellow virus being a slight increase in the number of local yellow spots. It appears that while the yellow strain is multiplying locally to form the spots, the green virus, which usually produces no local symptoms, becomes systemic to the exclusion of the yellow, the more so since the green strain (which can be isolated absolutely free of the yellow one) immunizes the tobacco plant against the latter. Cross immunity was also found between the two streak strains and two other strains of tomato streak, and between them and tobacco virus.

Filtration through graded collodion membranes indicated that the two strains have different filtration end-points (approximating 0·086 μ and 0·16 μ average pore diameter for the green and yellow strains, respectively) and can therefore be separated by this means. This difference in filterability is probably a quantitative effect and cannot yet be attributed to a difference in particle size. The fact that the yellow strain produced local yellow spots on mature tobacco leaves suggests that chlorophyll is actually attacked by it, and that the formation of the chlorotic spots is not merely due to inhibition of plastid formation [cf. ibid., xii, p. 525].

The work further showed that the virus of tomato streak and that of tobacco mosaic can easily be transmitted to healthy susceptible plants

by spraying them with a suspension of these viruses from an atomizer [ibid., xiii, p. 328], a fact which may in time lead to the discovery of a method of virus transmission hitherto unsuspected, apart from insect vectors or accidental contamination.

SHAPOVALOV (M.). **Effect of certain chemicals on the 'combination streak' virus of Tomatoes.**—*Phytopathology*, xxv, 9, pp. 864–874, 1935.

A number of chemical substances, known to produce a strong lytic action on certain micro-organisms, were added to unfiltered tomato juices containing the 'combination streak' virus [*R.A.M.*, xiv, p. 661] and left for two hours, after which the juices were applied to healthy young tomato plants and the results evaluated in comparison with the controls inoculated with untreated juices, the latter showing 100 per cent. infection in four to five days.

The following in ascending order of efficacy produced decided lytic effect on both components of the streak, of which B (latent potato mosaic) [ibid., xiv, p. 782] generally proved the weaker: the unconjugated bile acids, copper sulphate, potassium hydrogen sulphate, sodium salicylate, iodine suspensoid, antimony sulphate, bismuth sulphate, and sulphurous acid, the last-named being effective at relatively low concentrations (1·5 to 3 per cent.). Cobalt, nickel, and zinc sulphates (especially the first two) also exerted a lytic action on both components of the streak complex, but unlike the foregoing substances, they were not appreciably more toxic to B than to A (Johnson's tobacco mosaic virus No. 1) [see preceding abstract].

SHAPOVALOV (M.). **Graft versus insect transmissions of curly top in Tomatoes (Tomato yellows).**—*Phytopathology*, xxv, 9, pp. 844–853, 1 fig., 1 diag., 1935.

A tabulated account is given of the writer's experiments in California in the transmission of curly top (yellows) of tomato by grafting [*R.A.M.*, xiv, p. 202], from which it is evident that this method cannot effectively replace the standard procedure of inoculation with viruliferous leafhoppers (*Eutettix tenella*). The infection of one of a pair of approach-grafted tomato plants with the curly top virus does not guarantee the passage of the latter to the second grafted plant, the failure of which to contract the disease from the infected individual through the graft union occurs even when grafting and inoculations are made simultaneously and is much more likely when grafting is delayed five or six days, while no advantage was secured by advance grafting. The insect-inoculated shoot or scion may fail not only to transmit the disease to the healthy plant on which it is grafted, but may recover completely from all curly top symptoms after severance from its mother plant or stock below the graft union, or may never develop the symptoms at all. Similarly the stock, severed from a diseased scion, may fail to show any curly top symptoms or may recover from the disease, although the scion may continue to develop the symptoms and transmit them to the healthy plant on which it is grafted. The number of recoveries among the stocks of the inoculated plants was considerably larger than among the scions severed from them.

McClean (A. P. D.). **Further investigations on the bunchy top disease of Tomato.**—*Sci. Bull. Dep. Agric. S. Afr.* 139, 36 pp., 10 pl., 1935.

The following items in this fully tabulated account of the writer's continued investigations on bunchy top of tomato in South Africa are of interest in addition to those already noticed from another source [*R.A.M.*, xiv, p. 799].

The virus is rapidly destroyed by ten minutes' exposure to temperatures above 70° C. and partially inactivated at 60° to 70°; below 60° it was not appreciably affected. It lives for a comparatively short time in extracted juice, dying out rapidly after twelve hours, but was not appreciably reduced in virulence when subjected to an hour's contact with 30 per cent. alcohol. Within its hosts the bunchy top virus persists in an active state for lengthy periods, being recovered after 2½ years, for instance, from *Solanum diplosinuatum*. There was some evidence that passage through tobacco increases the virulence of the infective principle.

Bunchy top was experimentally transmitted to *Lycopersicum pimpinellifolium* and *Zinnia elegans*, besides the plants previously mentioned. The various hosts do not acquire infection with equal readiness by artificial methods. *Nicandra physaloides*, *Physalis peruviana*, *P. viscosa*, and others were infected easily by mechanical means, whereas *S. aculeastrum* was only infected once, and that by grafting. Tobacco was infected readily by grafting but not by mechanical inoculation. *Datura stramonium* appeared to be immune. In their reaction to the bunchy top virus, these species, apart from *P. peruviana*, remained normal in appearance or showed changes of a comparatively mild form, the most important effect of the virus being to retard the rate and amount of growth. The so-called 'severe disease' of *P. peruviana*, which developed spontaneously in two individuals and is substantially identical with bunchy top, is not yet clearly understood, though it appears to be definitely associated with the presence of the bunchy top virus—normally comparatively innocuous to this species. 'Severe disease' was artificially transmitted by mechanical means and grafting from *P. peruviana* to the same host and tomato and from the latter back to *P. peruviana*. Bunchy top was readily induced in tomato by inoculation back from other Solanaceae, though the symptoms did not in general develop quite so rapidly as when tomato itself was the source of the inoculum.

Hutchinson (W. G.). **Resistance of Pinus sylvestris to a gall-forming Peridermium.**—*Phytopathology*, xxv, 9, pp. 819–843, 3 figs., 1 diag., 1935.

No correlation was observed between resistance to infection by the 'Woodgate rust' (*Peridermium* sp. or, according to Arthur, an autoecious form of *Cronartium quercuum*) [*R.A.M.*, xii, p. 733; xv, p. 63] and any morphological feature of the individuals remaining immune from natural contamination and artificial inoculation during six consecutive years in the Woodgate district of New York. The inoculated trees showed three general types of reaction: (1) typical gall formation (susceptible); (2) cracking of bark and slight resinosis, sometimes followed by the formation of atypical galls (partial resistance); and (3) formation of small necrotic areas on the twigs, sometimes followed

by swellings remaining stationary in size after the first or second year and being gradually sloughed off (resistance). In the case of (1) the active growth of the mycelium in the host, involving a semi-mutualistic relationship, results in the stimulation of living cells and gall formation. In (2) the mycelium grows as far as the wound cork and may break through it and perhaps a second and a third cork layer before finally disintegrating. If the mycelium gets a foothold and is no longer checked, a gall may be developed but is often aborted or atypical. Necrotic areas are exfoliated and there may be a swelling of the stem due to the cambium being stimulated to form quantities of wound wood, including tangentially enlarged tracheids, giant cells, and tyloses in the tracheids, and resin ducts. In (3) the host cells are killed immediately after invasion, possibly by the liberation of toxin through the haustoria, and the fungus, deprived of its food supply, quickly dies, leaving the necrotic area, surrounded by cork and later by sclerenchyma, to be sloughed off. Both in resistant and susceptible trees the earliest invaded cells may become filled with tannin, a reaction possibly representing a form of local immunity.

No correlation was detected between the osmotic pressure or hydrogen-ion concentration of the cell sap and resistance, but there is some indication that this property may be connected with nutritional factors, a larger amount of potassium having been found in non-infected than in susceptible stems.

BUISMAN (C[HRISTINE]). **Sensibilité de diverses espèces et variétés d'Orme à Ceratostomella ulmi.** [Susceptibility of different species and varieties of Elm to *Ceratostomella ulmi*.]—*Rev. Path. vég.*, xxii, 3, pp. 200–208, 1935.

Further investigations in Holland into the reaction of different elm species and varieties to *Ceratostomella ulmi* [*R.A.M.*, xiv, p. 726 and next abstracts] showed that the following Asiatic species were moderately resistant, though without importance economically: *Ulmus wilsoniana* [cf. loc. cit.], *U. macrocarpa*, *U. parvifolia*, *U. shirasawana*, *U. sieboldii*, and *U. sieboldii* var. *coreana*. Of all the species and varieties tested *U. pumila* and its var. *pinnato-ramosa* are the most resistant, but under Dutch conditions the former is susceptible to *Nectria cinnabarina* [ibid., xiv, p. 665]. No elm has yet been found which can suitably replace *U. hollandica belgica* in Holland.

In attempts to find the most resistant individuals among seedlings of the best European species, hundreds of seedlings of *U. foliacea*, *U. glabra*, and *U. laevis* were inoculated with *C. ulmi*, the infected seedlings eliminated, and the remainder reinoculated, sometimes as frequently as thrice in one summer. These experiments were continued for several successive years, branches from the most satisfactory seedlings that showed resistance being grafted on to *U. hollandica belgica*. The scions found insufficiently resistant on further inoculation were eliminated.

As a result the author now possesses a few seedlings of *U. foliacea* and two of *U. glabra* which are highly resistant, one seedling of the former species from Spain, no. 24, combining very marked resistance with a vigorous growth habit. Scions of this are being studied and

grafts have been distributed to growers for propagation but their sale will not be permitted for two or three years. Layers from it are also being grown and submitted to additional inoculation. Further tests of seedlings are also being made, chiefly of *U. foliacea*, since only very few resistant individuals occur in seedlings of *U. glabra* and *U. laevis*.

FRANSEN (J. J.). **Onderzoekingen over de Iepenziekte verricht aan het Laboratorium voor Entomologie te Wageningen in 1934.** [Investigations on the Elm disease conducted at the Laboratory for Entomology at Wageningen in 1934.]—*Tijdschr. PlZiekt.*, xli, 9, pp. 240–260, 1935.

Observations at Utrecht are stated to have shown that *Graphium* [*Ceratostomella*] *ulmi* [see preceding and next abstracts] is capable of persisting for four years in a quiescent state in elm trees before breaking out in epidemic form in the entire absence of bark beetles (*Scolytus scolytus* and *S. multistriatus*) [see next abstract]. Similar reports have been received from C. May in the United States. Some evidence was obtained that the mite *Pseudotarsonemoides innumerabilis* is concerned in the transmission of the fungus [*R.A.M.*, xiv, p. 665].

FRANSEN (J. J.) & BUISMAN (CHRISTINE). **Infectieproeven op verschillende Iepensoorten met behulp van Iepenspintkevers.** [Inoculation tests on various Elm species with the aid of Elm bark beetles.] —*Tijdschr. PlZiekt.*, xli, 9, pp. 221–239, 1 pl., 1935.

Observations having shown that elm bark beetles (*Scolytus scolytus* and *S. multistriatus*) taken at random from trees attacked by *Graphium* [*Ceratostomella*] *ulmi* [see preceding abstracts] are not necessarily infected to any appreciable extent by the spores of the fungus, various methods of artificial infection were devised [*R.A.M.*, xiv, p. 665]. Of these the most satisfactory consisted in placing the insects in Petri dishes between felt mats soaked in cherry juice on which *C. ulmi* had been cultured, the mats being kept apart by an iron ring. A strip of cheese-cloth, below which the beetles were released, was affixed to every one of the 20 to 24 trees used in each of the four experiments. In three out of four trials the trees were also inoculated directly with *C. ulmi*.

The results of the tests, which were carried out between 30th May and 17th July, 1934, at Haarlem and Amersfoort, are tabulated and discussed. The July inoculations produced few infections, probably owing to seasonal factors, since the activity of the beetles, shown by the number of feeding places in the bark, was considerable at this time. The insects fed on all the trees on which they were placed, causing definite symptoms of die-back on *Ulmus glabra fastigiata*, two strains of *U. foliacea*, *U. hollandica belgica*, and the Karagatch elm. Of these the first-named is normally resistant, being probably avoided by the beetles owing to the tendency of the injured bark to exude large quantities of sap. Of the trees inoculated in the ordinary way, *U. glabra fastigiata*, one strain of *U. foliacea*, and *U. hollandica belgica* contracted infection, the results with the other strain of *U. foliacea* and the Karagatch elm being inconclusive. A considerable degree of resistance was shown by *U. wilsoniana*, *U. pumila pinnato-ramosa*, and *U. macrocarpa*. *C. ulmi* was reisolated from 32 out of 36 sections of branches

fed on by the artificially inoculated beetles, the corresponding numbers for the material exposed to insects collected haphazard from the bark being only 11 out of 32. These data are regarded as clearly showing the importance of the elm bark beetles in the transmission of *C. ulmi*.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. NachrBl. dtsch. PflSchDienst*, vii, 8, pp. 169–171, 172–174, 1935.

HOLLAND. An Order of 9th May, 1935, provides for the immediate inspection by the Plant Protection Service of any field plot bearing potatoes suspected of infection by wart disease (*Synchytrium endobioticum*). Potatoes infected by wart disease or grown in contravention of the provisions herein laid down (respecting the cultivation of immune varieties, restriction to certain localities, and the like) may not be moved or exported.

U.S.S.R. An Order of the Agricultural Commissariat of Plant Protection of 22nd April, 1935, prohibits the importation from foreign countries of all kinds of vegetables and root crops, such as potatoes, sweet potatoes, carrots, and beets, with the exception of fresh 'table vegetables' (cut and freed from roots and soil), to be examined at the frontier, for the use of embassies and legations. A Verbal Note of the People's Commissariat for Foreign Affairs of 22nd July, 1935, permits the importation of vegetables from abroad into Saghalien and Kamschatka until 1937 and into Primorié during 1935 on condition of accompaniment by an official certificate vouching for the freedom of the consignments from pests and diseases in general and for the absence of wart disease during the last six years within a radius of 20 km. of the place of growth of the imported potatoes and other vegetables.

Government of Palestine. Plant Protection Ordinance, 1924. Order No. 129 of 1935, by the Officer Administering the Government under section 3.—8 pp., 1935.

Schedule I of the Plant Protection Order (No. 2) 1934, Amendment Order, 1935, dated 5th September, 1935, prohibits, except under official authorization for scientific purposes, the importation into Palestine [*R.A.M.*, xiv, p. 544], in addition to items previously mentioned, of all species of citrus other than citrus fruits from Egypt, Syria, or Cyprus, mango other than fruit being the *bona fide* produce of Egypt, avocado pears, papaws, custard apples (*Anona* spp.), figs (all species of *Ficus*), pomegranate (plants only), guava (plants only), mulberry (plants only), palms except date palm fruit, cotton (except ginned), and all species of *Hibiscus*. Under Schedule II properly authenticated certificates of freedom from disease in general and from certain disorders in particular are required in the case of vine (court-noué or arricciamento) [ibid., xiv, p. 675] and Egyptian mango fruit (*Bacillus mangiferae*), besides others previously stipulated. Schedule III provides that citrus nursery stock and budwood and mango stock or budwood imported under special permit for scientific or experimental purposes shall be accompanied by a certificate of freedom from disease in general and in particular from *Pseudomonas citri* and *Sphaceloma fawcettii* in the case of citrus and from *B. mangiferae* in that of mango.

Special regulations, effective as from 1st October, 1935, are hereby introduced for the importation of seed potatoes. All seed potatoes are to be imported only through the ports of Jaffa or Haifa, and every consignment must be accompanied by (*a*) a certificate stating that the produce was not grown in land infested by wart disease (*Synchytrium endobioticum*), and (*b*) that it is free from wart disease, powdery and common scabs (*Spongospora subterranea* and *Actinomyces scabies*, respectively, up to 10 per cent. infection by each of which is tolerated, however, provided the surface area of the tubers so infected does not exceed 10 per cent.), and blackleg (*Bacillus phytophthorus*).

A Proclamation. The Plant Protection Ordinance, 1935.—*St. Vincent. Govt Gaz.*, lxviii, 45 (Extraordinary), pp. 249–251, 1935.

Under section 4 of the Plant Protection Ordinance, No. 14 of 1935, the Administrator of the Island of Saint Vincent and its Dependencies prohibits, as from 1st August, 1935, the importation into the Colony of the following: (*a*) soil; (*b*) packages for cotton seed, seed cotton, cotton lint, or cotton seed meal; (*c*) plants, fruits, seeds, cuttings, or other parts of cotton, citrus (except fruit of orange and grapefruit from British West Indian Islands), sugar-cane, coffee (except from the British West Indian Islands), banana, plantain, or other *Musa* spp., cacao, coco-nut, sweet potatoes, cassava, arrowroot [*Maranta arundinacea*], *Hevea* [*brasiliensis*], nutmegs, and ground-nuts; (*d*) fruits and vegetables not specied in paragraph (*c*), except from the British Isles, Canada, the United States, and the British West Indies (excluding Bermuda, Jamaica, the Bahamas, and British Guiana) from which countries a certificate of origin is required, this restriction not being applicable to nuts, processed fruits, and vegetables, onions, and potatoes.

As from 1st September, 1935, no plants or parts thereof (except manufactured or processed products, nuts, onions, potatoes, garden seeds, and the fruit of orange or grapefruit) may be imported into the Colony without a health certificate (a form of which is appended) except at the discretion of the Agricultural Authority, who may also import any plant material if obtained with the approval of the Committee of the Plant Quarantine Station, Trinidad.

The following are declared to be 'proclaimed diseases' within the meaning of the Ordinance [which empowers the Agricultural Authority to quarantine nurseries within 20 yds. of plants infected by such diseases]: bud rot [*Phytophthora palmivora*: *R.A.M.*, xv, p. 15] and little leaf of coco-nut, mosaic of sugar-cane, wither-tip of lime [*Gloeosporium limetticolum*: ibid., xiv, pp. 84, 146], Panama and 'moko' diseases of the banana [*Fusarium oxysporum cubense* and *Bacterium solanacearum*: ibid., xiv, p. 181; xv, p. 64] (the former also being a 'notifiable disease', except in such areas as may be declared to be 'Panama disease-infected areas'), and burning disease [*Rosellinia* (*?*) *bunodes*: ibid., xiii, p. 74] of arrowroot [*M. arundinacea*].

Under section 27 of the Plant Protection Ordinance, 1935, the removal from the 'Panama disease-infected areas', comprising the Parishes of St. George and that part of the Parish of Charlotte lying to the south of the Coronarie river, of any part or parts of banana plants, including the fruit and trash, to any other part of the Colony is prohibited.